Small Farmers and Big Retail: Trade-offs and Dynamics of Supplying Supermarkets in Nicaragua

by Hope Carolyn Michelson

SMALL FARMERS AND BIG RETAIL: TRADE-OFFS AND DYNAMICS OF SUPPLYING SUPERMARKETS IN NICARAGUA

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Hope Carolyn Michelson

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Hope Carolyn Michelson, Ph.D.

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This dissertation analyzes contracting relationships between large-scale corporate retail and small farmers in Nicaragua between 2000 and 2008 and estimates the effects of participation this new market on household income and investment in productive assets. This research addresses three issues of central importance in the changing context of world agriculture: what are the determinants of small-scale farmers' participation in new markets evolving amid globalization? How do farmers choose among market opportunities, given that market selection now implies a varying set of investments and transaction requirements, and what are the consequences of their choices both for near-term household welfare and for investments in technologies and asset stocks with the potential to transform future income dynamics? Finally, what can be learned about modern marketing channels from the significant share of farmers who exit supermarket supply chains?

The research in this dissertation validates both optimism and caution with respect to the potential of supermarket supply relationships to improve farmer welfare and stimulate productive investment. The evidence here indicates that farmers who enter the supermarket supply chain benefit from the insurance the contract provides against the significant volatility of the traditional market horticulture output price. Contracted farmers both experience significant positive effects on incomes and make significant investments in productive assets

and irrigation. However, we conclude that the location of supermarket procurement basins is strongly determined by community access to roads, markets, and year-round water, suggesting that modern agri-food marketing channels may exacerbate extant rural geographic inequalities or create new ones.

We find an extremely high rate of exit from the supermarket supply chain, evidence that discontinued suppliers warrant considerable more attention in future analyses of participation in and welfare effects of modern agri-food markets. We also find that farmers own participation decision is influenced by neighbors' experience and exit from the modern channel. Finally, we should remain prudent with respect to predictions of the long-term sustainability of estimated income and asset returns attributable to participation. Given the significant involvement of NGOs and the relatively early stage of the Nicaraguan supermarket sector, it remains to be seen what the regional equilibrium effects will be for the agricultural sector as more farmers enter these markets.

BIOGRAPHICAL SKETCH

Hope Michelson grew up with her younger sister Sarah in Urbana, Illinois, the college town where her parents Bruce and Theresa still live. Deferring her admission to Georgetown University, she spent a year before college waitressing and cooking in a Middle Eastern restaurant, working in a nursery school in rural Kentucky, and traveling. At Georgetown, she double majored in History and English literature but took advantage of the liberal arts setting to complement her studies with courses in biology, cognitive science, art history, and religion.

During her time as an Agricultural Economics Masters student at the University of Illinois, her advisors Hamish Gow and Alex Winter-Nelson encouraged her to seek funding to support a year of research in Mexico. She received a fellowship to study the adoption of Monsanto seed technology in Vicente Guerrero, Chiapas, a small farming community close to Tapacula, Mexico. In that year of living in Chiapas, her deep affection for and curiosity about Mexico and Central America were confirmed. Hope has returned to the region many times. Highlights have included a month spent hitch-hiking El Salvador, late nights visiting taco stands in the Yucatan, mornings in Mexico City markets, and a sojurn with the Monarch butterflies in their winter home in El Rosario. Her research year in Nicaragua began with a month long drive from Ithaca to Managua in a powerful, indomitable 1992 Subaru.

Hope came to Cornell in 2004 for her PhD, and produced this dissertation under the guidance of Dr. Christopher Barrett. Spending a year at the Nitlapan Institute in Managua, Nicaragua, she rode happily in the back of many battered 4x4 pickup trucks to gather data for her study. She lived for four lovely years as an Ithaca resident, and married Seppe Kuehn at the Ithaca Farmers' Market in the summer of 2009.

As a post-doctoral researcher at the Earth Institute at Columbia University Hope will work with the data and the researchers of the Millennium Villages Project.

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Nicaragua

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The data and qualitative details in this analysis were gathered in Nicaragua between September 2007 and July 2008 in collaboration with the Nitlapan Institute at the Universidad Centro Americana. In Managua, Francisco Perez and Arelys Morales Cardoza welcomed and advised me throughout and taught me the on-the-ground logistics of conducting a large-scale household survey

in Nicaragua. This work benefitted from frequent informal conversations with Jennifer Weigel and Ricardo Hernandez, in which we hashed out the evolving theses of our respective dissertations on Nicaraguan supermarket operations. Veronica Palladino from Cornell helped gather data on growth of supermarket retail outlets. In Managua, I was fortunate to live the year in the delightful home of the Jiminez-Mairena family. Thank you to Belinda, Cairo, Hanoy, Yaosca, Vito, Chiara, Mattia, and Pancho for their hospitality and friendship.

Friends and family

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I leave Ithaca with an incredible group of friends of rich and varied backgrounds and interests: Annemie, Sudha, Erin and Jason, Vivian, Kurt and Krista, Abhijit, Daniel, Jessica, Lisa and Joanna, and the residents of Gamma Alpha. Thanks to Greg and Victoria, Ian and Tiffanie for making Ithaca feel like home in my final year, when Seppe and home was four and a half hours south.

Seppe, thank you for your curiosity, excitement, and creativity. This dissertation involved nearly two years of time spent apart and you remained patient and supportive throughout. I started this project five years ago with a new boyfriend. I finish with a husband who is my co-conspirator, my editor, and my confidant in all ideas and endeavors.

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CHAPTER 1

INTRODUCTION

Over the last 20 years, international trade negotiations and agricultural policy reform in the developing world have dismantled many of the government controls on agricultural markets, opening new commercial spheres for farm production and new choices for farmers. Calls have come from both the private sector and leading international development agencies to build a new regime of poverty reduction strategies around emerging markets, and a large number of market-led initiatives have already taken shape.

How do farmers choose among market opportunities, given that market selection now implies a varying set of investments and transaction requirements, and what are the consequences of their choices for household welfare? Answering these questions is of utmost importance to understanding how some agricultural producers are able to make the transition out of poverty in the context of new, dynamic markets. Under the protected market system, a producer's expected output price distribution was independent of crop quality and transaction scale. Now, questions of producer crop quality and scale capacity are fundamentally connected to poverty, as a producer's access to more lucrative or more stable marketing channels is a function of his ability to supply a product of a particular standard according to a stipulated scale and schedule.

An emerging literature (Glover and Kusterer, 1990; Goldsmith, 1985; Hoeffler, 2005; Singh, 2002; Winters *et al.*, 2005; World Bank, 2007) explores the possibility that collaborations between the private sector and developing world smallholders might be mutually beneficial, solving regional credit, transportation, insurance, and market incentive problems while opening new opportuni-

ties for international and domestic businesses. Development economists have remained largely silent regarding emerging trends to privatize development work, projects that have been historically the domain of public institutions and NGOs.

This dissertation analyzes one such relationship between large-scale corporate retail and small-farmers and the ramifications of this new market for questions of household technology adoption and investment in and returns to productive assets. We study the participation dynamics and welfare effects of sourcing relationships between supermarkets and small farmers in Nicaragua between 2000 and 2007. This research addresses three issues of central importance in the changing context of world agriculture: what are the determinants of small-scale farmers' participation in new markets evolving amid globalization? If small farmers do participate, what are the effects not merely on incomes but also on investments with the potential to transform a household's future income dynamics such as technology adoption and productive assets? And what can be learned about these modern agri-food marketing channels from the significant share of farmers who exit supermarket supply chains? Which farmers choose the volatility of the traditional market over the possibilities and requirements of the supermarket channel?

The research in this dissertation validates both optimism and caution with respect to the development potential of supermarket supply relationships. The evidence here indicates that farmers who enter the supermarket supply chain benefit from the insurance the contract provides against the significant volatility of the traditional market horticulture output price. Contracted farmers both experience significant positive effects on incomes attributable to the supply re-

lationship and make significant investments in productive assets and irrigation. However, the location of supermarket procurement basins and household participation is strongly determined by access to roads, markets, and year-round water, suggesting that modern agri-food marketing channels may exacerbate extant rural geographic inequalities or create new ones.

We find an extremely high rate of exit from the supermarket supply chain, evidence that discontinued suppliers warrant considerable more attention in future analyses of participation in and welfare effects of modern agri-food markets. Finally, we should remain prudent with respect to predictions of the long-term sustainability of estimated income and asset returns attributable to participation. Given the significant involvement of NGOs and the relatively early stage of the supply relationships and the Nicaraguan supermarket sector, it remains to be seen what the regional equilibrium effects will be for the agricultural sector as more farmers enter non-traditional markets.

This introduction serves three purposes. First, we contextualize our research within broader trends that suggest the beginnings of a fundamentally new approach to development strategy, an approach establishing firmer connections between corporate and smallholder profit motives and a sustained reduction of rural poverty in the developing world. Second, reviewing the recent literature on supermarket expansion and operations in the developing world we argue that within emerging intellectual and political trends promoting market-led development, supermarket relationships with smallholders suggest an opportunity for rich debate as well as a need for additional careful research by agricultural and development economists. Our findings are summarized in the final pages of this introduction.

1.1 Background: Market-led agricultural development

Proponents of private-sector development initiatives argue that the rural poor stand to profit from free, global markets, and that market mechanisms will get incentives right, promoting investment and attacking the manifold causes of poverty with efficiency and efficacy (Prahalad and Hart, 2004). Supporters also cite the endemic nature of world poverty, the declining levels of official development assistance (ODA) to agriculture and the sustained failure of many governments to come to the aid of their own people: problems of chronic mismanagement, political stalemate, or corruption (World Bank, 2004).

In addressing market failures faced by smallholder agricultural production, increasing the involvement of the private sector would seem a strong option for developing countries, which might thereby access expertise, resources, and integrated management systems, all without taking on the risks and expense of market research, development, and distribution as government functions. Compounding this apparent advantage is the possibility of external funding. Publicly financed international aid and philanthropy dedicated to agricultural development is becoming more scarce. A 2005 IFAD discussion paper reports that the percent of ODA has been declining – over the past two decades the real value of aid to agriculture in the late 1990s had fallen to 35 percent of its late 1980s level (Audinet and Haralambous, 2005). In the early 1980s, lending for investment in the agricultural sector comprised 30 percent of total World Bank lending; by 2000 the share of lending to agriculture had decreased to 7.9 percent (Audinet and Haralambous, 2005). At the same time, there has been widespread consolidation in the retail and processing sectors of the global food system, and a corresponding consolidation of capital and investment in research, marketing,

and development.

Multinationals including DuPont, Monsanto, Pioneer Hi-bred International, Nestlé, Wal-Mart, and Unilever, as well as a large number of domestic, developing-world corporations, are increasing commercial activity with the world's smallholder producers, developing solutions to the multiple market failures pervasive in small-scale agricultural production. Though private sector development represents an emerging trend in the worlds community of influential development groups, the effects that such collaboration might have on smallholder production, prices, and market participation as yet unknown and untested by proponents. Similarly, analyses from the corporate sector lack transparency and are generally based on weak research methodology. Evidence is largely anecdotal and claims of effects and successes unsubstantiated. Moreover, data on the participation in and effects of these initiatives are proprietary and often difficult to access.

There is considerable diversity in the degree to which these early private-sector development players are facilitating the economic terms of the market interaction with poor producers. At one extreme, the projects resemble classic government development models, with agribusinesses offering improved seeds, agrichemicals and fertilizers, agricultural extension, credit and market access to participant farmers. Other projects affect considerable producer behavioral responses through market presence alone, as price margins orient local incentives with regard to adoption of a particular technology or crop. Still others establish relationships with intermediary nongovernmental organizations (NGOs) who aggregate production quantities and negotiate contracts and logistics. In Nicaragua, supermarkets that originally offered inputs provision to

farmers have subsequently retreated from interlinked factor and product market contracts in the face of farmer default and side-selling and the entry of NGOs providing farmers with access to the requisite training and inputs.

What makes these seemingly disparate initiatives analytically similar is that (1) their long term welfare outcomes depend in part on the dynamism and volatility of the market and are therefore unknown and (2) they involve questions of market access and participation explicitly in an analysis of poverty dynamics, introducing the possibility that farmers may be sorted, or are sorting, for participation based on some set of heterogeneous wealth or production characteristics. For example, if an inverse relationship between farm size and productivity is a valid assumption (Bardhan, 1973), smallholders would be expected to have some productive advantage by virtue of the scale of their operations. But what are the implications of an emerging system of relationships with large, concentrated buyers in which convenience, and scale assurances matter in markets?

Profit maximization on the part of firms working in developing markets suggests that contracts will be offered to those farmers most likely to succeed, adding a new dimension to the analysis of welfare effects of technology and market adoption. Economic analysis concerned exclusively with productivity would be missing an important component, namely, the value that production can generate in the marketplace through higher prices linked with quantity. Producers who can afford investments in the inputs, labor or land required to achieve higher production capacity would consequently secure higher prices. One key idea here is that producers with higher levels of initial wealth would now experience locally increasing returns in markets with endogenous prices as

functions of farmer asset level, credit access, or scale of production.

Research questions evolving from such initiatives are intriguing, and they require a departure from conventional thinking on agricultural production and marketing in developing countries. With the right products and the right payment structure, will resource and liquidity constrained producers demand and pay for those services long provided (at least in part) by governments, including better market information, superior agricultural inputs, agricultural credit and insurance, storage capacity, price stability, and irrigation technologies? Can markets adequately serve the needs of producers and can the market mechanism lead to the adoption of socially optimal production technologies?

Certainly, government and NGO agricultural development regimes have often favored selective criteria for program participation, with access accruing to those who are better connected politically or well-positioned socially within a community. But unleashing the private sector on the challenges of development requires that we be especially careful and accurate with respect to identifying populations of likely beneficiaries and also of losers in any given arrangement, and possible social outcomes. If the private sector is to be explicitly woven into poverty alleviation strategies, two coordinated questions are of relevance: Which farmers will have access to these new market opportunities? How can we understand the effects of these projects on market participation and poverty reduction? My research in Nicaragua examines such questions in the context of a new addition to farmers' output market choice set: an unprecedented nationwide system of supermarkets.

1.2 Supermarkets: Developing world trends

The significant recent growth of supermarket retail in Latin America, Africa, and Southeast Asia (Reardon and Berdegue, 2002; Reardon *et al.*, 2003; Weatherspoon and Reardon, 2003) has implications for the structure and prospects of traditional agricultural markets and production. Academics and policy makers concerned with poverty in the developing world have watched the rapid growth of modern food retail and sourcing with both excitement and trepidation. Supermarket chain expansion implies the emergence and expansion of new high-value agricultural output markets for the labor intensive crops in whose production small farmers might compete competitively, but how will they be included in this structural transformation?

We review briefly the literature about the growth of these supermarket systems, a literature that falls into three general classifications. A first, foundational collection of papers establishes the growth of supermarkets across regions or countries. A second set of papers investigates the effects of this emerging presence on the structure of particular agrifood sectors within countries. A third round of studies surveys groups of participant and non-participant producers to study the association of participation with measures of productivity and well-being.

1.2.1 Macro trends in supermarket expansion

Thomas Reardon at Michigan State University has generated a considerable body of research documenting the recent and strong growth of the food re-

tail market share claimed by supermarkets in the developing world. Reardon's "rise of supermarkets" series of papers argues that over the past 10 -15 years supermarkets in many developing countries have transitioned from once-niche markets for the metropolitan rich to increasingly major players in domestic food retail. This first wave of papers document a widespread trend: Africa (Reardon *et al.*, 2003); Latin America (Reardon and Berdegue, 2002); Central and Eastern Europe (Swinnen and Maertens, 2007); China (Dinghuan *et al.*, 2004). These studies rely on detailed industry surveys and interviews with chains and buyers conducted by the research teams for information about in-country growth and operations and chain-specific policies.

Early studies described a striking pattern of overall growth with significant regional variation in the depth and rate of growth trends. For example, supermarkets have emerged in Latin America from a negligible presence in the early 1990s to claim a 50-60% share of the total Latin American food retail market,[1] a market transition that took nearly five times as long in the United States (Reardon and Berdegue, 2002) In Southeast Asia, supermarkets emerged as a market presence between five and seven years later than in Latin America but their growth over the past ten years in Indonesia, Thailand, Malaysia, the Philippines, Chinese urban areas and South Korea has been much faster (Reardon and Timmer, 2007). Widespread supermarket penetration of food retail is not ubiquitous in the developing world, however, in many countries, particularly in sub-Saharan Africa, supermarket's share of food retail remains minimal (Humphrey, 2007; Muendo and Tschirley, 2004).

The country-level supermarkets diffusion literature argues that the rapid

[1]The supermarket share of the fresh fruit and vegetable market often grows more slowly than the share of the total food retail market but the gap closes as the overall share grows.

spread of supermarkets is likely to increase with the growth of domestic demand-side drivers: rising incomes and urbanization, increased opportunity cost of time (particularly of women), and reduction in consumer transactions costs through improved transportation networks. A major supply-side factor has been an increased openness among developing world governments to foreign direct investment (FDI) in retail (Reardon and Timmer, 2007).

A second wave of research documents the structural transformations at a regional level, investigating the effects of the "rise of supermarkets" on within-country production sectors, documenting the factors that distinguish supermarket procurement networks from traditional markets. This research describes the evolution of procurement networks and value chains: dairy in Poland (Dries and Swinnen, 2004), the horticulture system in Kenya (Neven and Reardon, 2008) and Central America (Berdegué *et al.*, 2005; Jano and Mainville, 2006). As in the macro diffusion studies, researchers concerned with the structural implications of regional diffusion rely on case study evidence: industry interviews occasionally bolstered with farmer group discussions or surveys.

The regional diffusion literature describes fundamental differences in organization, supporting institutions, and coordination between traditional and supermarket-driven channels, suggesting that differences in channel prices, schedules of payment, credit access, standards, monitoring, technology demands and extension services may be important determinants of participation, as well as determinants of welfare effects.

The national and regional literature describes significant differences distinguishing the operations of supermarket channels from traditional spot markets. Supermarket chains maintain product grades and standards through stream-

lined and integrated rural buying operations. These procurement systems eliminate intermediate transactions and require supplier conformity with stricter product quality or process standards, a minimum scale of transaction, or some combination of these. Supermarket buyers generally partner with a specialized wholesaler or contract directly with farmers.

In contrast, the traditional spot market system generally involves many fractured operations and duplications of effort: a rural middleman/trader purchases products from farmers and sells to a wholesaler who then sells through a regional wet market or directly to a retailer. Traditional systems are often informal, non-contracted, and characterized by direct sale with payment at the time of transaction. Products sourced through the traditional chain and sold in small shops, central markets and wet-markets tend to be commodities with minimal differentiation. Producers rarely know the final destination of their crop nor do final buyers know the source of the product and there is little coordination between final consumer and grower.[2]

Structural market transformation initiated by supermarkets reveals one overriding motive: supermarkets want farm products of a particular quality and adequate volume, produced by specific agricultural practices; they also prefer transactions conforming to a pre-determined scale and schedule. In contrast to the traditional spot-marketing channel, supermarkets supply production guidelines; to ensure quality, they may also monitor production and post-harvest handling techniques. Participation in a modern marketing channel and access to its relatively more remunerative opportunities, therefore, can represent some investment in time or capital resources on the part of producers in

[2]Transport and search costs as well as risk and information flows along the channel will vary depending on the product sourced and the region and extent of operations.

order to meet product quality and transaction requirements. The third broad category of the recent supermarkets literature has examined these investment pressures and opportunities at the level of the participant household.

1.2.2 Micro-level studies

The final, empirical microeconomic class of supermarket studies have examined the effects of supermarket-driven agrifood market transformations. This group of papers examines the behavior, welfare, and operations of smallholder producers adopting and operating in supermarket supply chains. These researchers have been concerned with two primary research questions: establishing household determinants of participation and estimating the welfare effects of participation.

Given that understanding the determinants of participation is arguably at least as interesting as estimating the welfare effects of inclusion, few studies have given sufficient careful attention to the question of participation; generally, selection into a supermarket procurement channel is estimated as the requisite first stage in an estimate of welfare or technology effects. A probit model is used on the sample of suppliers and comparison non-supplier group to determine factors influencing participation. These participation estimates generally rely on proxies for explanatory variables drawn from technology adoption models. For example, Neven *et al.* (2009) include lagged land ownership and farm size to capture risk-sensitivity, education to capture access to financial capital and human capital, and lagged presence of an irrigation system as a proxy for physical capital. Hernandez *et al.* (2007), Balsevich *et al.* (2005), and Dries and

Swinnen (2004) use similar variable sets: the grower's age, the grower's years of education, family size, a dummy indicating whether the grower is equipped with transportation, distance in kilometers from the farm to the nearest paved highway, lagged dummies indicating membership in a growers association and irrigation, and lagged variables for farm size, and livestock holdings.

This research suggests that small farmers are included in supermarket supply chains, but inclusion is confined to those who are already well-capitalized, those with irrigation and access through established producer associations acting as distribution networks. Maertens and Swinnen (2009) find that the probability of participation in contract farming in Senegal is higher for households with more land and labor. Hernandez *et al.* (2007) find irrigation is a key determinant of participation for tomato growers in Guatemala; Neven *et al.* (2009) find that the likelihood of a farm participating in the supermarket channel in Kenya is higher for larger farms and for those with drip or overhead irrigation. Balsevich *et al.* (2005) find that this likelihood of participation in supermarket tomato procurement channels in Nicaragua increases for producers that are involved with a producers' association but decreases with off-farm income and grower's age.

In existing studies, there are at least two potential problems with the treatment of small farmer participation in supermarket supply chains. First of all, there has been no analysis as yet of the determinants of participation at the country level, that is, how supply chains and procurement basins are geographically situated within a country or region. Nor has there been research into how geographic characteristics such as community access to infrastructure and water interact with a household's own assets and endowments to influence par-

ticipation. In particular, availability of adequate water to promote year-round cultivation of horticulture is likely to jointly determine participation and outcomes and it is critical to understand such a determining factor, both in order to control for it in welfare estimations and to be able to identify what areas are and are not likely candidates for future inclusion into supermarket procurement basins.

A second gap in the literature has to do with the duration of these supply relationships and also with their termination. To our knowledge, no research has yet examined whether the tenure of a farmer's supply relationship influences welfare outcomes. Nor has any work yet looked at the experience of discontinued suppliers, those that leave the supply chain. Understanding welfare outcomes conditional on duration of the relationship, however, provides insight into the way that supply contracts with supermarkets evolve and the way that effects can be expected to endure should the marketing relationship end.

For example, the probit estimations of participation determinants cited above use a binary participation variable, so producers either sell into a supermarket procurement channel or they don't. Modeling the participation as a $0/1$ variable is akin to modeling technology adoption as a dichotomous decision. The interesting question, however, from either a development or a microeconomic perspective is not merely who joins a particular marketing channel, but how long they participate and whether they exit. Why do participants join and then drop out? Is the threshold for participation the same as the threshold for exit? Is adoption "reversible"?

Market exit is a potentially important source of information about market adoption and several case studies suggest that channel disadoption is preva-

lent. In their comparative study of supply chains for supermarkets in Bangkok and Nanjing, Ruben, Boselie, and Lu (2007) find that the retailer TOPS in Thailand began with 250 producers in 1998 but had scaled back to 60 growers by 2002. Similarly, a case study of the Brazillian supermarket sector found that 61,000 small dairy farmers were dropped as suppliers by supermarkets between 1996 and 2000 and a study of a Guatemalan tomato grower's association found that the 330 participant producers in 2000 had shrunk to 30 by 2001 (Jano and Mainville, 2006).[3] If we are interested in the dynamic, long-term effects of participation we must also be concerned with these patterns of participation, the constant supply chain entry and exit of farmers.

Regarding the welfare effects of supermarket supply relationships with small farmers, research has found that technology-channel correlates suggest capital-intensive technologies associated with the supermarket channel are associated with both higher revenues and higher costs. Hernandez *et al.* (2007) find roughly equivalent profit rates across Guatemalan tomato farmers who supply supermarkets and those who do not; participants are found to have higher yields but report considerable overuse of pesticides and fungicides and higher expenditures on chemicals. Balsevich *et al.* (2005) find that suppliers have profits per unit of land nearly 50 percent higher than traditional markets but that participant production costs (per unit of land) are 38 percent higher than for non-participants. Neven *et al.* (2009) estimate comparable cost per unit of output and overall productivity across the channels; supermarket channel participants in their Kenyan sample have between 60 and 70 percent higher average land and labor productivity, 40 percent higher gross profit margins and

[3]The ASUMPAL producers transitioned in 2000 from producing for the wholesale market to contracting with McDonalds of Guatemala. The contract specified quality standards, delivery timing, packaging, and quantity, requiring large producer investments including drip irrigation, greenhouses, delivery trucks, packing sheds.

rapid growth – an on average doubling in their scale of operations between 2000 and 2005.

Results from several studies raise the possibility that longer or more frequent production cycles are associated with supermarket participation. Balsevich *et al.* (2005) find that growers accessing supermarkets plant an average of 0.6 more cycles in a year than traditional growers. Neven *et al.* (2009) find that supermarket purchase agreements for suppliers with long-term supply agreements are often year round, and they suggest that the essential participation limitation of traditional rainfed producers is their inability to produce year round. Minten *et al.* (2009) find that higher welfare for Malagasy participants due to the shorter lean periods is associated with more supermarket contracts, but that participant producers also report shorter lean periods than non-participants before participation.

With regard to this literature, one additional dimension requiring development is the mechanism through which supply relationships transform welfare. Analysis of the effects on productivity cited are an excellent foundation for this analysis, but the existing research makes a number of critical and untested assumptions about the ways in which the remunerative potential of supermarket supply chains compare with traditional marketing channels. For example, no paper has addressed whether the terms of exchange for small farmers – both level and variance – are better or worse with modern versus traditional retail. Moreover, the analysis has been confined to study of the average payoff, with little attention to variability in payoff. A number of works have posited that supermarkets reduce output price variability but have lacked data to test whether variability is reduced and by how much.

Extrapolation of the supermarkets research to address broader questions of development economics and policy depends on understanding the specific pathways through which supermarket supply relationships affect participant welfare. The analysis of technologies by channel choice (Balsevich *et al.*, 2005; Hernández *et al.*, 2007) explores one possible mechanism, but other plausible candidate mechanisms that we explore include: increases in prices in the supermarket supply chain, increased market price stability permitting increased investment in production and increased quantities, increases in productivity, and increased credit access.

1.3 Dissertation summary and outline

This research provides a contribution to a nascent field within agriculture and development economics: the study of market participation patterns. Public policies, founded on accurate information and solid theory, could assure that new market forces will benefit at least a portion of the smallholders in developing countries. In the evolution of any such policy, one major question is which smallholders might be capable of acting as entrepreneurs, profiting from new private institutions of production and marketing.

The Green Revolution increased producer output per hectare, fertilizer-responsive, high-yielding varieties shifted the major source of growth from increases in crop area to increases in production per hectare. The next agricultural revolution may come through innovations in markets, shifting the major source of growth in farm income from increases in production per hectare to increases in value of production per hectare. As in the early years of the Green Revolu-

tion, there are many concerns about the welfare effects of these market trends for small farmers but little clear evidence as to what these effects will be. This dissertation provides crucial evidence at the critical early stages of development.

This dissertation makes four primary contributions to the nascent literature on supermarkets and smallholders in the developing world. First,our research in Nicaragua is the first to establish that the supply contract functions as a form of insurance against traditional spot market horticulture output price volatility. **Chapter 2** uses unique data on negotiated prices collected from Nicaraguan farm cooperatives supplying supermarkets to study the effect of supermarket supply agreements on producers' mean output prices and price stability. We find that prices paid by Nicaragua's domestic supermarket chain approximate the traditional market in mean and variance. In contrast, we find that mean prices paid by Wal-Mart are significantly lower than the traditional market but that Wal-Mart systematically reduces price volatility compared with the traditional market. We find some evidence, however, that farmers may be paying too much for this contractual insurance against price variation.

Chapter 3 demonstrates for the first time the geographic determinants of supply chain placement. We show that geographic and natural resource endowments are significant predictors of community inclusion in a supermarket procurement basin. Our research suggests that, with respect to welfare effects estimations attributing income or asset changes to participation in supply chains, the placement effect of supply chains may be at least as important as the selection effect at the household level. Our findings reinforce that smallholder access to new market opportunities may be limited not just by pre-supermarket asset positions or liquidity, but by access to water, infrastructure, markets, and nat-

ural resource endowments. Conditioning on supply chain placement, we estimate the welfare effects of supply relationships on participant and exiting farmers. We use instrumental variables analysis to control for the farmer selection effect and also to estimate the effect of supplier arrangements with supermarkets on a set of welfare variables including household per capita incomes, irrigation, and productive assets. Our approach is the first to instrument for three dimensions of participation in supermarket supply chains: current supplier status, tenure of farmer participation in the supply chain, and discontinued supply relationships. We find positive statistically and economically significant effects on participant farmer incomes, productive assets, and irrigation. We find evidence of a growth effect, larger effects on incomes and productive assets accruing to farmers with longer tenure supply relationships. Our evidence suggests that these income and productive asset increases are retained by farmers who exit the supply chain. In addition, we find a significant positive level effect on irrigation investment for current suppliers and a corresponding negative effect on the irrigation investment of exited farmers. We use household survey data to investigate three candidate mechanisms that might drive positive effects on household income, irrigation, and productive assets: the supermarket supply agreement loosens the liquidity constraint; the supermarket supply agreement increases agricultural productivity; or the relationship spurs farmer investment. We find evidence that the supply contract is associated with increased farmer access to credit. This credit, combined with the price insurance of the contract, permits and promotes increased farmer investment in horticulture.

Accumulating evidence suggests that farmers learn from one other in the adoption of agricultural technologies (Conley and Udry, 2010; Foster and Rosenzweig, 1995; Maertens, 2009; Moser and Barrett, 2006; Munshi, 2004). The

final chapter of this dissertation examines whether similar social learning dynamics apply to the case of market participation. **Chapter 4** analyzes the determinants and dynamics of farmer exit from the supermarket supply chain. We use a simple lifecycle model to explain supermarket supply chain participation and exit patterns and we hypothesize that farmers learn about the relative profitability of a new marketing channel from their neighbors' experience in the supply chain and from neighbors' exit. Our model therefore incorporates own experience, own exit, neighbors' experience, and neighbors' exit from supermarket supply chains into a conditional logit model to test whether farmers' observation of these variables influence a his decision to participate in subsequent periods and to estimate whether some farmers pay a price for experimentation with the new market opportunity.

Results from a fixed effects conditional logit model estimating the likelihood of participation in supermarket supply chains among Nicaraguan farmers suggest that neighbors' exits from the supermarket supply are significant negative influences on a farmer's own decision to participate in the new market while observation of neighbors' accumulating experience in the supply chain is a significant positive determinant of farmer's participation. However, observing a neighbor's exit is a significantly more powerful signal than observing another year of neighbor experience. Observing a neighbor's exit is significantly more influential for farmers who are already supplying the supermarket compared than for farmers that have not yet entered the supply chain.

CHAPTER 2

TRADE-OFFS FOR SMALLHOLDERS SUPPLYING SUPERMARKETS: PRICE MEAN AND VOLATILITY

2.1 Introduction

Supply relationships between supermarket chains and small farmers in the developing world represent a key intersection of current critical dimensions of economic theory and policy: participation of the rural poor in regional and global markets; possibilities for rural entrepreneurship in developing world contexts; and contract negotiation between small, constrained growers and large, well-capitalized buyers to resolve idiosyncratic market failures.

This paper uses data from Nicaraguan supermarket contracts to analyze market relationships emerging between farmers and supermarkets. The contracts we examine are negotiated by three Nicaraguan farmer-cooperatives and vary both over supermarket chains and over time. Using these data we can establish for the first time how supply agreements affect farmers' output price distributions compared with the traditional market and how contract terms change over time. The resulting analysis offers a new perspective on potential payoffs to participation in supermarket supply chains for farmers.

Research has focused both on understanding whether and why supermarkets source from small farmers and on establishing welfare effects of supply relationships on small farmers. Considerable research has anticipated (Barrett and Reardon, 2000; Blandon *et al.*, 2009; Gibbon, 2003; Key and Runsten, 1999; Kirsten and Sartorius, 2002) and identified (Boselie *et al.*, 2003; Dolan and

Humphrey, 2000; Reardon *et al.*, 2003) the exclusion of small farmers from supermarket supply chains. Other findings suggest that small farmers are included (Maertens and Swinnen, 2009) or find that inclusion is confined to those small farmers who are relatively well-capitalized with non-land capital such as irrigation (Hernández *et al.*, 2007), or who gain access through established producer associations (Balsevich *et al.*, 2005).

Most of the research analyzing participation in supermarket supply chains also considers the welfare effects of that participation. There has been less rigorous analysis as yet of the way that supermarket supply relationships affect participants' mean output prices and price stability. Typically, the approach has been to compare average returns per kilogram, perhaps controlling for quality, between farmers supplying to supermarkets and those not. The extant literature does not empirically test for increased farmer mean profit or decreased marketing risk under contractual relationship with a supermarket. For example, in their study of supermarket suppliers in Senegal, Maertens *et al* (2008) write "small farmers...reduced production and marketing risks" (p.5). Similar assumptions can be found in Swinnen (2007), Boselie *et al* (2003), Kirsten and Sartorius (2002), Neven and Reardon (2008), and Swinnen and Maertens (2007).

Two important gaps thus exist in the literature. First, no paper has addressed whether the terms of exchange for small farmers – both level and variance – are better or worse with modern versus traditional retail. Second, while there has been measurement of the average payoff over channels using farm data, the robustness of these findings has not been validated over time, over contract types, or chains. Moreover, the analysis has been confined to study of the average payoff, with little attention to variability in payoff. A number of works have

posited that supermarkets reduce output price variability but have lacked data to test whether variability is reduced and by how much.

Building on the insights of existing research, we use historical prices negotiated between supermarkets and farmers to analyze for the first time the average payoff and payoff variability of supermarket channels compared with the traditional market. We find that prices in La Colonia, the domestic chain, approximate the traditional market in mean and variance. In contrast, we find that mean prices paid to suppliers of Wal-mart supermarkets are significantly lower than the traditional market. Instead, we find that Wal-Mart supply agreements represent significant reductions in price risk to farmers over the traditional market. Deriving farmers' implied relative risk aversion from these contracts, we find some evidence that farmers may be paying too much for this implicit insurance against price variation. Our findings, which support the extant hypothesis in the literature that supermarkets decrease output price variability, add new evidence to the current debate regarding supermarkets in the developing world as agents of change and economic stimulus.

This study uses data collected from two primary sources. First, we gathered from three farmer cooperatives detailed records of the historical prices negotiated with supermarkets. Figure 2.1 presents the sequence and coverage of the price data from cooperatives. Several of the supply relationships are ongoing; arrows in the figure indicate supply relationships that continue past the period of data coverage. Second, we use historical (January 2001–June 2008) traditional market weekly price data from the Nicaraguan government Ministry of Agriculture and Forestry (MAGFOR) office.

Because our analysis compares crop prices across marketing channels, we

have given careful consideration to possible quality differences between markets. Based on interviews with supermarket buyers and traditional market wholesalers as well as considerable time spent observing transactions in wholesale markets and supermarkets, we have found that supermarkets in Nicaragua purchase the premium share of a farmers' production for the horticultural crops studied here. Our results indicate that the mean supermarket purchase share of farmers' total production is close to 70 percent. The 70 percent supermarkets purchase is carefully culled: for example, Wal-Mart follows a tightly-guarded manual of product-specific quality standards, codifying required attributes such as variety, size, coloration, cleanliness, damage, and weight. La Colonia follows a similar quality selection process. In contrast, traditional market wholesalers purchase nearly 100 percent of a seller's production, buying all size grades, discarding only damaged or extremely small vegetables or fruits.

Because supermarkets purchase less than 100 percent of the farmers' production and because that share is carefully edited to meet chain-specific standards, our analysis assumes that mean product quality in the supermarket channel is at least as high as the traditional channel. Because we compare a product in the supermarket chain with quality at least as high as the traditional market, our finding that mean prices in the supermarket chain are not significantly higher than in the traditional market is made even stronger.

The next section provides context: critical features of the Nicaraguan traditional and modern horticulture markets, the population of horticulture producers, and the operations of the two primary supermarket chains operating in the country. The third section analyzes the mean and variance in output price, comparing supply agreements between farmers and supermarkets in Nicaragua to

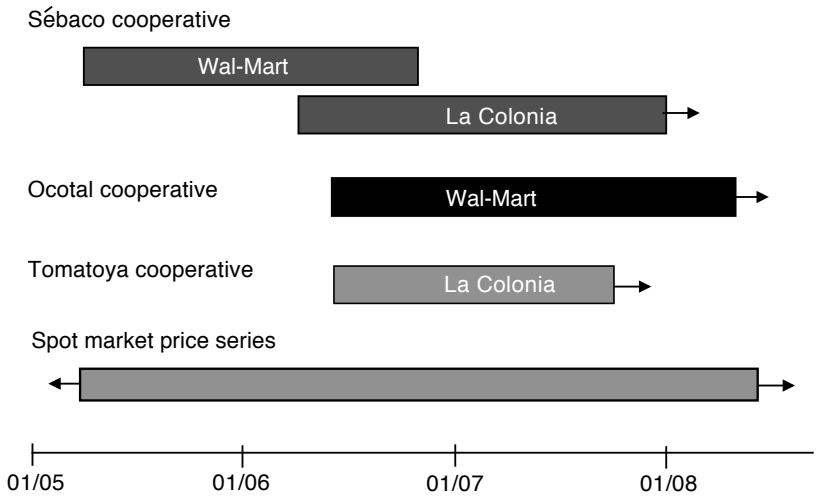

Figure 2.1: Schematic of time periods of farmer cooperative supply relationships covered by our data.

the traditional wholesale market. A fourth section derives coefficients of farmer relative risk aversion to evaluate the mean/variance trade-off for a producers' cooperative in the Wal-Mart supply chain. The final section concludes.

2.2 Fresh fruit and vegetable production in Nicaragua

Nicaragua's population of horticulture producers constitutes a tiny share of total farmers. According to the country's 2001 agricultural census, while 76 percent of landholding farmers grew basic grains including maize, beans, and sorghum, only 2.14 percent cultivated tomatoes, 1.23 percent green peppers, and 0.25 percent cabbage (MAGFOR, 2001).

Statistics on irrigation suggest the existence of dual production structures in Nicaragua's tiny horticulture sector; approximately one-third of 2001 horticulturalists were equipped with production and price risk-mitigating irrigation.

Moreover, the population of irrigated horticulturists in the 2001 agricultural census was split between large growers (19.6 percent) and small and medium growers with less than seven hectares (17.2 percent).

This production dualism defined by irrigation is critical to producers' experience in seasonally volatile horticulture output markets. Rainfed Nicaraguan horticulture farmers generally produce one or two seasons of crops each year and sell their harvest in a regional spot market or to a buyer at the farmgate. Nicaraguan small farmers without irrigation describe a volatile boom-bust cycle of fresh fruit and vegetable farming driven primarily by output swings in the market. The farmer without irrigation, cold storage, or means to move perishable product quickly to another zone must sell when there is a local glut and suffer the price drop. Thus, farmers without irrigation are likely to be more concerned about price variability than those with irrigation who can sell in times of high prices and benefit from price variation.

Dualism in the Nicaraguan horticulture production sector therefore suggests a potential tension in supermarket contract adoption. While the supermarket is likely to prefer irrigated farmers who can offer the retailer steady supply streams throughout the year, those with irrigation and capacity have less incentive to adopt the contract given that they are already playing the market, riding out the ups and down of the output price. Conversely, rainfed horticulture farmers struggling to manage high price volatility will have more incentive to adopt the supply contract but are likely to be hindered by a lack of productive capacity.

A third-party program funded by the United States Agency for International Development (USAID) has emerged in Nicaragua to equip small farmers with

the liquidity and irrigation systems to permit an intensive farming schedule and to begin to resolve this contracting asymmetry. In June, 2006 USAID contracted with four multinational NGOs to begin working with farmers on a three-year, $20 million project (USAID and Nicaragua, 2006) designed to meet the needs of supplying supermarkets in Nicaragua.

These intermediary NGO programs seem to have obviated supermarkets' distinction between farmers with irrigation and without. We observe that farmers adopting supply contracts in this analysis are largely those likely to value the price stability associated with the contract and the capacity building facilitated by the NGO: small farmers without irrigation before the program. The 54 suppliers who are members of the three cooperatives included in this analysis are overwhelmingly drawn from the rainfed horticulture sector. Table 2.1 disaggregates supplier farmers according to their 2001 landholdings and irrigation in the year before supply chain entry; mostly small farmers (77.8 percent) and mostly without irrigation (88.9 percent).

Table 2.1: Supply cooperative farmers' landholdings and irrigation in the year before joining the supermarket supply chain.

	Without irrigation	With irrigation	Total
Small farmer (0-3.5 hectares)	36	5	41
Medium farmer (3.5-7)	4	0	4
Large farmer (> 7 hectares)	5	4	9
Total	45	9	54

2.2.1 Supermarkets in Nicaragua

Two companies dominate Nicaragua's supermarket retail: La Colonia is a 10-store (2008) family-owned national chain that has operated in Nicaragua since the late 1960s; and Wal-Mart Central America, which acquired a controlling stake in Corporacion de Supermercados Unidos' (CSU) 380 Central American retail outlets in April 2006. As of May 2009, Wal-Mart had expanded CSU's 33 retail stores in Nicaragua to 52 Nicaraguan outlets.

Wal-mart's two Nicaraguan chains are Palí, a group of discount grocery stores positioned to compete directly with traditional markets and La Union, an upscale chain catering to wealthier consumers in Managua and León. Before 2002, the number of supermarkets had remained steady for many years with the majority of stores confined to Managua, the country's political and economic capital. Figure 2.2 graphs the number of supermarket retail outlets in Nicaragua, increasing steadily since 2000. The number of retail outlets outside of Managua has recently exceeded the number of stores in the capital.

In Nicaragua, supermarkets' sourcing strategies are increasingly reliant on small farmers. Since 1998, Nicaragua's supermarkets have shifted their procurement networks away from a dependence on imports and traditional market wholesalers. Figure 2.3 graphs the yearly population of small farmers supplying La Colonia and Wal-mart since 2000.

The two retail groups have developed distinct procurement strategies. La Colonia relies heavily on a network of traditional wholesalers as well as approximately 50 preferred small farmers working alone or in one of two producer cooperatives. Because La Colonia has no warehouse, the company holds min-

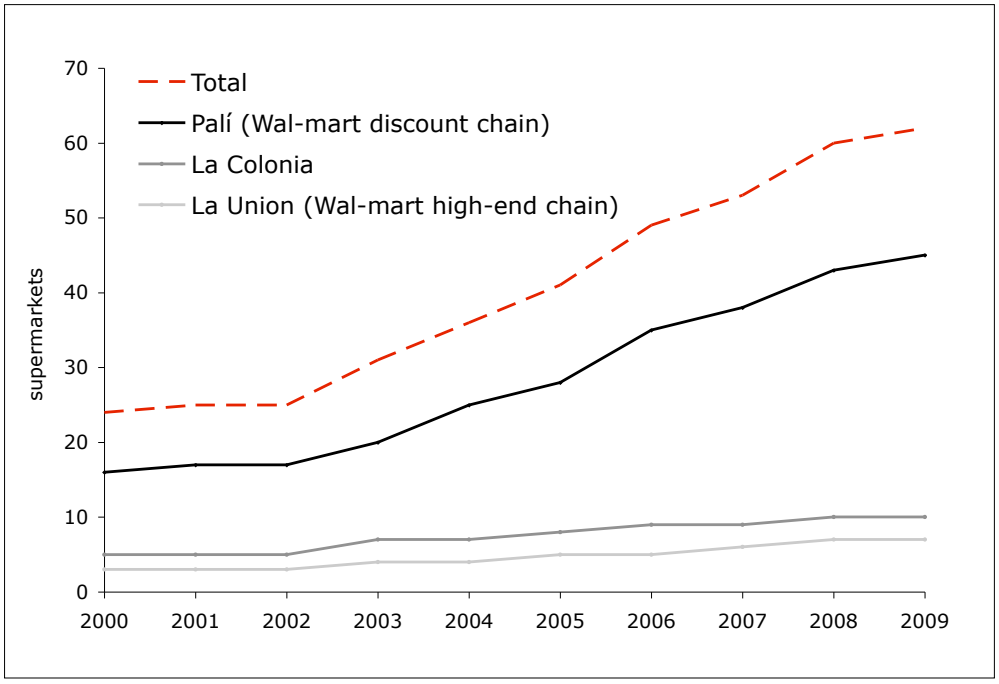

Figure 2.2: Annual quantity of supermarket retail outlets in Nicaragua, 2000–2009.

imal inventory between purchases and suppliers daily transport fresh produce to the chain's headquarters in Managua.

Wal-Mart has taken a different approach to developing a domestic supply chain in Nicaragua, using buyers to source products in rural areas rather than relying on farmers to manage transport. Wal-Mart's procurement division picks up production from supplier farmers in the farmers' field or community. As Wal-Mart has extended procurement and retail into more remote regions, the company has kept transport costs down by using supply trucks to backhaul

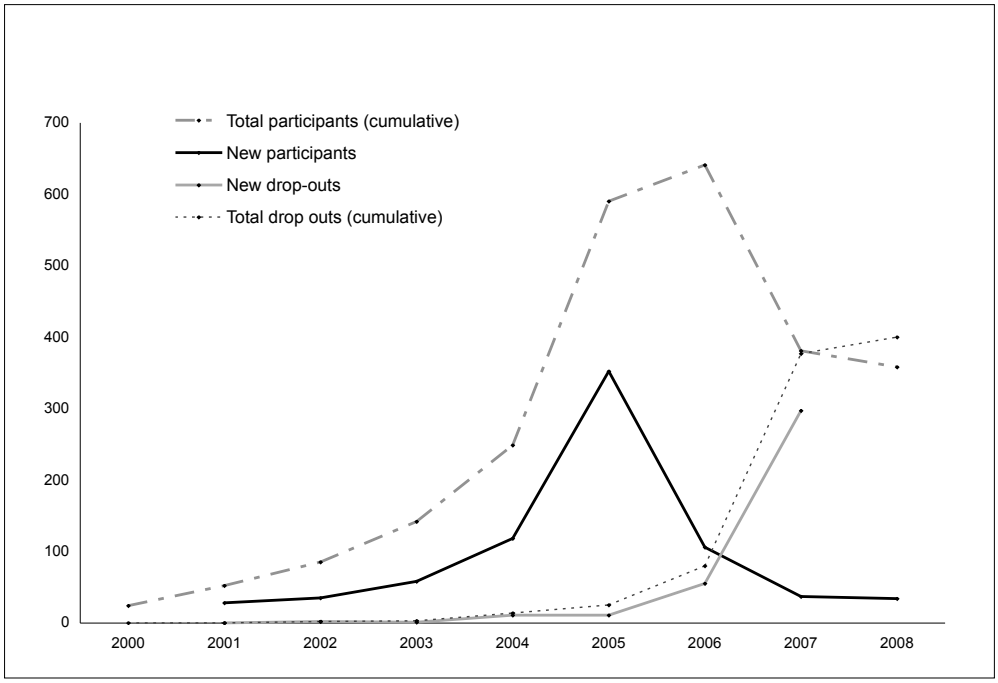

Figure 2.3: Annual population of supermarket suppliers and exits in Nicaragua, 2000-2008.

agricultural production to the central warehouses.

2.3 Small farmer outcomes: Price mean and volatility

Taking the contract choice as given, in this section we use data from traditional markets and producer cooperatives to study how supply agreements between small farmers and supermarkets affect mean price and price stability.

Units of analysis: per kilogram prices at farmgate

Our analysis uses per kilogram farmgate prices to compare the traditional and supermarket channels. Transaction sites vary by supply chain, so we equalize prices at the farmgate by subtracting transport costs to comparison markets. We describe briefly how the farmgate price series are constructed.

Because Wal-Mart picks up products sourced from farmers in farmer communities well outside the capital city, we equalize transport costs between the Wal-Mart farmgate prices and the Managua-sited transactions of La Colonia and the traditional wholesale market. We subtract cooperative-specific transport costs from the La Colonia and Managua traditional market prices.[1] Once we equalize transport costs, we can compare farmgate prices between our three price series: traditional (Managua), Wal-Mart (farmgate), and La Colonia (Managua).

Unless otherwise noted, prices are compared between supermarket and traditional market channels over equivalent time periods. That is, if a contract relationship between a supermarket and a cooperative lasted between April 2005 and November 2006, the comparison traditional market price series is considered for the same period. Also unless otherwise specified, all prices in the paper have been adjusted to July 1999 Cordobas. One January 2008 US$= 14.53 July 1999 Cordobas ($C). Computed farmgate prices are gross per kilo; we do not

[1]We have good comprehensive estimates for transportation costs that include the per mile cost of the truck, gasoline, and driver generated using the Sébaco cooperative's round-trip cost for the trip between Managua and Sébaco (50 miles oneway) and the truck's capacity. The Sébaco cooperative rents the truck from a member of the cooperative and pays the cost of the gasoline and the driver. All three cooperatives are located on a good road network, at varying distances from Managua. We applied the per-pound/per-mile transport cost to each cooperative's mileage from Managua to generate cooperative-specific transport costs. The cooperatives are at varying distances from Managua: Tomatoya is 70 miles away, Ocotal is 103 miles distant. Roads between cooperatives and Managua are of consistent and decent quality.

subtract production costs of the farm.

Non-transport related transactions costs

We have observed that farmers selling to supermarkets generally incur the standard transactions costs of the traditional market in addition to the costs of sorting, grading, cleaning, and packing production to meet supermarkets' specific quality criteria. We therefore assume that non-transport related transactions costs are at least as high in the supermarket channel as in the traditional wholesale market. Significant qualitative and survey evidence motivates our assumption. To begin with, both La Colonia and Wal-Mart demand significant cleaning, selecting, and sorting of the product to meet stipulated quality standards. These costs are not incurred in the traditional channel. Moreover, as discussed in the introduction, while farmers can sell all of their production in traditional markets with minimal loss due to quality grading, our data indicate that farmers supplying supermarkets sell approximately 70 percent of their production.[2] Because the supermarket does not purchase all of a farmers' production, farmers and cooperatives are generally in multiple markets, selling product rejected by the supermarket to a broker at farmgate or to a wholesaler in a local or regional market. This means that participant farmers generally incur the transactions costs of two markets instead of one.

[2]This rate includes product rejection quantities; both La Colonia and Wal-Mart reject produce that does not meet specifications and supplier farmers in our household survey reported per transaction crop rejection rates between 0 and 80 percent with an average per transaction rejection percent over the 2000-2008 period of 5.8 percent.

2.3.1 Supermarkets do not increase mean prices

Because supermarkets purchase a premium share of the farmers' production and require post-harvest processing beyond the demands of the traditional market, we expect farmers selling to supermarkets to receive higher mean output prices for their production. We can test whether mean per kilo prices in the supermarket channel are significantly higher than in the traditional market by matching data collected from cooperatives with traditional market prices over corresponding periods. Because the two retail chains' distinct procurement strategies have important implications for the analysis, we evaluate the chains' contract prices in turn.

Wal-Mart

The timing of the contract observations is valuable to understanding the sequence of Wal-Mart supply agreements. We observe two epochs of Wal-Mart supplier relations: the Sébaco cooperative is an example of first-generation Wal-Mart supply agreements and Ocotal a second-generation contract. The Sébaco cooperative sold to Wal-Mart between April 2005 and November 2006 but left the Wal-Mart relationship to supply La Colonia, providing us with an observation of a cooperative that operated in both supermarket channels and demonstrated a preference for La Colonia over Wal-Mart. The Ocotal cooperative contracted with Wal-Mart as the Sébaco cooperative left the supermarket in mid-2006.

In the top half of Table 2.2 we compare mean per kilo farmgate prices between Wal-Mart and the traditional market using a standard t-test to test for equivalence in means between the traditional market and supermarket farm-

gate price distributions.

We find that, for both first and second-generation contracts, mean per kilo prices for both salad and roma tomatoes are significantly lower selling to Wal-Mart than the traditional channel for both cooperatives. The gap in mean prices across the channels is striking and economically significant; the difference between Wal-Mart and the traditional market price (as a percent of the Wal-Mart price) is between 34 and 54 percent.

Note that farmgate prices in Table 2.2 were negotiated and reported by cooperatives assisted and at least partially financed by NGOs. These cooperatives sell in bulk quantities via one group transaction to the supermarkets, reducing buyer coordination, quality assessment, and transport costs. Because of the convenience, quality, and bulk quantity attributes they offer the supermarkets, these suppliers are positioned to negotiate relatively a high price with supermarkets. Yet here we find the opposite.

La Colonia

In the bottom half of Table 2.2 we compare the La Colonia price series against their traditional market counterparts for the Sébaco and Tomatoya cooperatives.

We find that La Colonia's mean farmgate prices compare somewhat more favorably to the traditional market than Wal-Mart. La Colonia represents a mix of both higher and lower mean farmgate prices than the traditional market. Over the specified time periods[3] we find: La Colonia's mean lettuce farmgate prices

[3]If we test farmgate prices received by cooperatives from supermarkets against farmgate prices in traditional markets for all dates between 2000-2007, and not merely for restricted dates over which the cooperatives sold to supermarkets, our results do not change significantly. Using the full series, we reject the hypothesis that traditional and supermarket means are equal for green peppers (traditional market significantly higher for the full series) and salad tomatoes (La Colonia significantly higher). All other results are consistent whether we use the full or reduced

are significantly lower than traditional market sales; La Colonia's mean salad tomato and cabbage prices are significantly higher than the traditional market channel; and we fail to reject the hypothesis of the equivalence of mean farmgate prices between the La Colonia channel and the traditional market for per kilo roma tomato and small green peppers.

Table 2.2: Mean farmgate prices in Wal-Mart, La Colonia and the traditional market (2005-2007).

heightCrop	Dates (mm/yy)	($C/kilo)	($C/kilo)	p-value
Wal-Mart		Traditional	Wal-Mart	
Sébaco co-op				
Roma tomatoes	04/05-11/06	**5.23**	3.40	$< 10^{-4}$
Salad tomatoes	04/05-11/06	**6.68**	4.41	$< 10^{-4}$
Ocotal co-op				
Roma tomatoes	06/06-05/08	**6.33**	4.24	$< 10^{-4}$
Salad tomatoes	06/06-05/08	**7.94**	5.92	$< 10^{-4}$
La Colonia		Traditional	La Colonia	
Sébaco co-op				
Roma tomatoes	04/06-12/07	**6.40**	**6.30**	$p = 0.77$
Salad tomatoes	04/06-12/07	7.88	**9.99**	$< 10^{-4}$
Tomatoya co-op				
Small green peppers	06/06-10/07	**7.51**	**6.71**	$p = 0.09$
Cabbage	06/06-10/07	1.57	**2.60**	$< 10^{-4}$
Lettuce	06/06-10/07	**5.57**	4.85	$< 10^{-4}$

Results in Table 2.2 demonstrate two general results. First, prices in the su-

series for the traditional market.

permarket supply channel are not always significantly higher than the traditional market. Second, La Colonia offers a mean price that is a much closer approximation to the traditional market while Wal-Mart compares relatively poorly with the traditional market, paying suppliers significantly below parity.

These results are even more surprising given that prices in Table 2.2 are gross of post-harvest production costs specific to the supermarket chain including cleaning, selection, and packing. For example, Sébaco cooperative farmers who sell to La Colonia contribute three percent of their sales proceeds for administrative services and weekly pay a team of ten women who select and clean produce $C 100 apiece (2008 Cordobas). So the net supermarket farmgate price is even lower than reported above. Again, because of the post-harvest processing and selection costs incurred by the farmer cooperative we would expect a significantly higher mean price. Yet this is not what we find.

Our analysis of supermarkets' relative mean price raises two interesting questions. Why might farmers accept a low price for a quality product if a higher traditional market price was available? And why are mean farmgate prices with Wal-Mart systematically lower than the traditional market relative to La Colonia?

One explanation for the differences between the chains in Table 2.2 is the difference in procurement structures distinguishing the Wal-Mart supply network from the La Colonia system: Wal-Mart sends its trucks to the farmers' community to source production while La Colonia suppliers make the trip to the supermarket's Managua headquarters themselves. Wal-Mart, therefore, can exploit the existence of regional spatial market segmentation in horticulture by assuming the transportation costs and logistical risks of sourcing the crop in the

field.

Evidence that field brokers at farmgate pay a price below the extant wholesale market price less transport costs would suggest the presence of market segmentation; an opportunity for Wal-Mart's procurement and contracting. Table 2.3, which compares per kilo mean prices farmers reported receiving at farmgate from traditional wholesalers, presents evidence to this effect. Surveyed farmers were asked maximum, minimum, and most common (modal) price observed for their most remunerative crop. A triangle distribution was used to infer the mean of the regional farmgate wholesale price paid by field brokers. For comparison, we include corresponding Wal-Mart, La Colonia, and Managua mean per kilo farmgate prices.

Table 2.3: Farmgate broker, Managua, La Colonia (LC), and Wal-Mart (WM) price means (2005-2007).

		Farmgate*			mean	Managua	LC	WM
Crop ($C)/kilo)	n	min	max	mode	(est.)	mean	mean	mean
Sébaco co-op								
Indust. tomatoes	28	0.71	9.41	2.34	2.84	6.40/5.23	6.30	3.40
Tomatoya co-op								
cabbage	32	0.20	3.17	1.10	1.16	1.57	2.60	-
lettuce	52	0.29	9.80	1.70	1.76	5.57	4.85	-
Ocotal co-op								
indust. tomatoes	19	1.18	14.12	4.02	4.43	6.33	-	4.24

*farmgate min/max/mode reported by farmers in the 2008 household survey; n refers to the number of regional observations for each crop

Evidence in Table 2.3 suggests the existence of asymmetries in Nicaraguan horticulture markets in which local brokers sourcing at farmgate can pay a price below the extant wholesale market price less transport costs. Significant mar-

gins in Table 2.3 separate the per kilo prices farmers report receiving from traditional wholesalers at the farmgate and documented farmgate per kilo prices (price less transport) in the Managua market. Wal-Mart mean farmgate prices most closely approximate prices reported by farmers transacting with traditional buyers at the farmgate in Table 2.3. Note that we cannot use these data to actually test for the presence of supernumerary profits and thus local market power for either field brokers or Wal-Mart.

Evidence in Table 2.3 suggests the existence of spatial market segmentation that might result from a lack of public or private transport to take crops to market, credit to finance transport, information problems, or coordination failures to bulk production with other farmers. The assumption that Managua per kilo wholesale prices less transport costs should equal farmgate prices is based on a further assumption: that farmers can transport the crop to Managua themselves or that competition among farmgate traders bids away supernumerary-profit. A failure in the capital markets for small farmers, however, increases the price of transporting the crop if farmers cannot secure funds to purchase or rent transportation. A second problem could stem from limited competition among farmgate wholesalers in rural output markets; regional wholesaler monopsonies preserve trader marketing margins. Simultaneous failures in these two markets, high opportunity costs of farmer time, or coordination failures among farmers leave resource-poor small farmers to accept the low price offered by traders at the farmgate.

Evidence of supernumerary marketing margins separating farmgate prices from central markets in an environment of capital constrained farmers suggests an opportunity for arbitrage by a well-capitalized intermediary like Wal-Mart.

Reaching deep into the countryside, Wal-Mart's supply network facilitates participation by farmers who would otherwise lack the capital to transport product to the central market in Managua. The company can therefore take advantage of the significant price margins separating the city from the countryside, negotiating a per kilo farmgate price better than what traditional farmgate wholesale buyers offer rural farmers yet still significantly below the Managua price (less transport costs). Of course, it may be that Wal-Mart assumes significant procurement costs and earns no profit on the provision of procurement in farmers' communities. However, Wal-Mart's scale and efficiency imply bulk transport costs significantly less than the cooperatives' transport costs. These are possibilities that we cannot test using our current data.

La Colonia's transaction proximity to the Managua market explains why the domestic chain's prices tend to approximate or exceed the per kilo farmgate prices estimated from the Managua market prices (Table 2.2). La Colonia cannot take advantage of the spatial arbitrage opportunity because its suppliers come to Managua to make semi-weekly deliveries. La Colonia suppliers are equipped with trucks; they make habitual stops to sell excess supply at the Managua markets after delivering product to the supermarket.

2.3.2 Supermarkets stabilize output price

We examine in this section how per kilo farmgate price volatility differs across supermarket and traditional channels. Our analysis of whether supermarkets decrease output price volatility relative to the traditional market begins with a comparison across channels using statistics on channel variances and coeffi-

cients of variation. We then use first order stochastic dominance tests to more systematically study the producer's mean-variance tradeoff across traditional and supermarket channels.

Significant price volatility is a serious concern for farm households. When firms profit maximize, the convexity of the profit function implies a firm prefers price volatility. But if household production and consumption decisions are nonseparable and the household is income risk averse then residual uninsured risk exposure can lead to inefficient production and investment as households undertake costly measures to reduce exposure. A decrease in output price risk can be expected to lead to improved efficiency in production and investment.

Data from farmer cooperatives and the traditional market support the hypothesis that supermarkets reduce price volatility over the traditional market. Table 2.4 reports the first and second moments of producer cooperative and traditional market price distributions using the price data analyzed in Table 2.2. As in the analysis of mean prices across channels, we consider relative price variance by supermarket chain in turn.

Wal-Mart

The first and second moments of the price distributions reported in Table 2.4 suggest that Wal-Mart's suppliers negotiate a mean/variance tradeoff; a lower mean per kilo farmgate price is paired with less volatile price for all Wal-Mart crops and both first and second-generation contracts. Initial comparisons across moments of distributions in Table 2.4 suggest that the Wal-Mart relationship systematically dampens the volatility in farmgate per kilo prices compared with the traditional channel, but the exchange for this tempering may be a reduction

Table 2.4: Per kilo farmgate price mean and variance in supermarket and traditional market channels.

Crop (units)	Mean ($C/kilo)	Variance	CV (σ/μ)
Wal-Mart (WM)			
WM Sébaco co-op roma tomatoes	3.40	**0.66**	0.24
Managua roma tomatoes	**5.23**	2.68	0.31
WM Sébaco co-op salad tomatoes	4.41	**0.44**	0.15
Managua salad tomatoes	**6.68**	5.82	0.36
WM Ocotal co-op roma tomatoes	4.24	**1.68**	0.31
Managua roma tomatoes	**6.33**	7.51	0.43
WM Ocotal co-op salad tomatoes	5.92	**0.64**	0.14
Managua salad tomatoes	**7.95**	7.94	0.35
La Colonia (LC)			
LC roma tomatoes	6.30	**4.96**	0.35
Managua roma tomatoes	6.40	7.06	0.42
LC salad tomatoes	**9.99**	**2.81**	0.17
Managua salad tomatoes	7.88	8.94	0.38
LC peppers	6.71	7.25	0.40
Managua peppers	7.51	**6.47**	0.34
LC cabbage	**2.60**	0.27	0.20
Managua cabbage	1.57	**0.14**	0.24
LC lettuce	4.85	2.59	0.33
Managua lettuce	**5.57**	**1.59**	0.23

in mean price. Coefficients of variation in the Wal-Mart channel are uniformly lower than the traditional market.

La Colonia

As we found in our comparison of mean prices across channels (Table 2.2), La Colonia exhibits trends that are both distinct from Wal-Mart and distinct across crops. For example, the traditional lettuce market offers a more stable, higher mean per kilo farmgate price; La Colonia exhibits a higher mean and lower variance price for salad tomatoes; but cabbage prices are characterized by a higher mean with the supermarket and slightly higher variance.

We can more systematically study the producer's mean-variance tradeoff across channel-specific price distributions by testing the stochastic dominance of supermarket price distributions against the traditional market farmgate price distribution. Each crop-specific pair of price distributions is characterized by cumulative distribution functions F_T and F_S for the traditional and supermarket channels, respectively. For all monotonically increasing utility functions, distribution F_S first-order stochastically dominates (FOSD) distribution F_T if $F_S(x) \leq F_T(x)$ for all farmgate price levels, x. Using first order stochastic dominance tests, distributions can be ranked according to their returns. The weakness of the first order stochastic dominance test is that it is a partial ordering, unable to rank distributions whose cumulative distribution functions cross.

For the stochastic dominance tests, we use all dates for which we have price information for the traditional market. We include prices for all recorded dates for the traditional market under the assumption that the full 2001-2008 series better reflects the true intertemporal distribution of per kilo prices in the mar-

ketplace. To compare 2001-2008 prices with the period of the supply relationship we must assume both that the underlying price generating process is unchanged and that farmers perceive the 2001-2008 distribution as a consistent representation of the distribution of farmgate prices that they face.

Note that the comparison of per kilo prices below using stochastic dominance tests (Table 2.5) should be treated as a best-case scenario in a comparison of expected revenues across traditional and supermarket channels. The reason: our analysis compares per kilo farmgate prices while a comparison of total revenues would interact the price distribution under the supermarket with quantities sold. Evidence from our household survey data and farmer interviews suggest that supermarket relationships can introduce new areas of uncertainty into the producer portfolio of marketing risks. We have discussed supermarkets' tendency to purchase less than a farmer's total production. Moreover, supermarket agreements can increase a farmer's risk of total loss should the supermarket renege on the sales agreement at the time of harvest through failure to purchase or failure to pay. For example, our data suggests that the likelihood of loss due to supermarket failure to make payment is significantly higher than the traditional market; the reported annual incidence of supermarket payment default is 1.3 percent, nearly double the traditional market incidence rate at the farmgate and 14 times the payment default rate reported in regional markets.

Given that the supermarket represents an increase in both the probability of buyer default and of rejections resulting from standards enforcement, the supermarket per kilo revenue distribution will always have a higher mass at zero than the traditional markets. Therefore a dominance test comparing total revenue distributions between the traditional market and the supermarket channel,

the distribution of possible total revenue outcomes under the supermarket can never first order dominate the traditional market.

La Colonia

Table 2.5 presents a summary of the results of stochastic dominance tests. Figure 2.4 plots the cumulative distribution functions (CDFs) for both salad and roma tomatoes for La Colonia and the first and second-generation Wal-Mart contracts, illustrating the first order stochastic dominance tests in Table 2.5. All price CDFs are plotted against corresponding traditional market CDFs. For each comparison pair, FOSD indicates the market that first order stochastically dominates. Comparisons in which there is no first order dominance are indicated. As expected from results in Tables 2.2 and 2.4 La Colonia price CDFs in some cases dominate and in others are dominated by the traditional channel.

Table 2.5: Stochastic dominance tests comparing supermarket and traditional per kilo farmgate CDFs. For each comparison pair, FOSD indicates the market that first order stochastically dominates. Comparisons in which there is no first order dominance are indicated.

	Traditional Market	Supermarket
La Colonia contracts		
La Colonia roma tomatoes (Sébaco)		FOSD
La Colonia salad tomatoes (Sébaco)		FOSD
La Colonia peppers (Tomatoya)	FOSD	
La Colonia cabbage (Tomatoya)		FOSD
La Colonia lettuce (Tomatoya)	no first order dominance	no first order dominance
Wal-Mart:		
first-generation contracts		
Wal-Mart roma tomatoes (Sébaco)	FOSD	
Wal-Mart salad tomatoes (Sébaco)	FOSD	
Wal-Mart:		
second-generation contracts		
Wal-Mart roma tomatoes (Ocotal)	no first order dominance	no first order dominance
Wal-Mart salad tomatoes (Ocotal)	no first order dominance	no first order dominance

Wal-Mart

As with the mean price comparisons, the sequence of Wal-Mart supply agreements is critical to interpreting the FOSD tests. Results in Table 2.5 and the second row of Figure 2.4 indicate that traditional market first order dominates the supermarket for Wal-Mart's early first-generation contracts for roma and salad tomatoes from Sébaco.

In the FOSD joint analysis of the first and the second moment of the price distribution we see evidence of Wal-Mart's contractual evolution with its suppliers. In a departure from the earlier contracts, Table 2.5 and the bottom row of Figure 2.4 demonstrate that the second-generation contracts for tomatoes from Ocotal were not strictly dominated by the traditional markets; a cross in the CDFs renders the test inconclusive.

In fact, the dominated nature of Wal-Mart's first generation contracts may explain the introduction of the second-generation agreements. Early Wal-Mart supply agreements did not increase mean farmgate prices for the farmer relative to the traditional market – indeed, our data indicates that these contracts were stochastically dominated by the traditional market.

The second-generation of Wal-Mart contracts codified what had previously been an implicit price insurance of the contract. Beginning in 2007, Wal-Mart introduced supply agreements that explicitly provide farmers insurance against price risks of the traditional market. The company also began moving NGO-backed farmers and farmer cooperatives to year-round production agreements featuring seasonal planting plans. In early 2008, farmers described three distinct contract types, all contracts pegged to a reference traditional market price, an

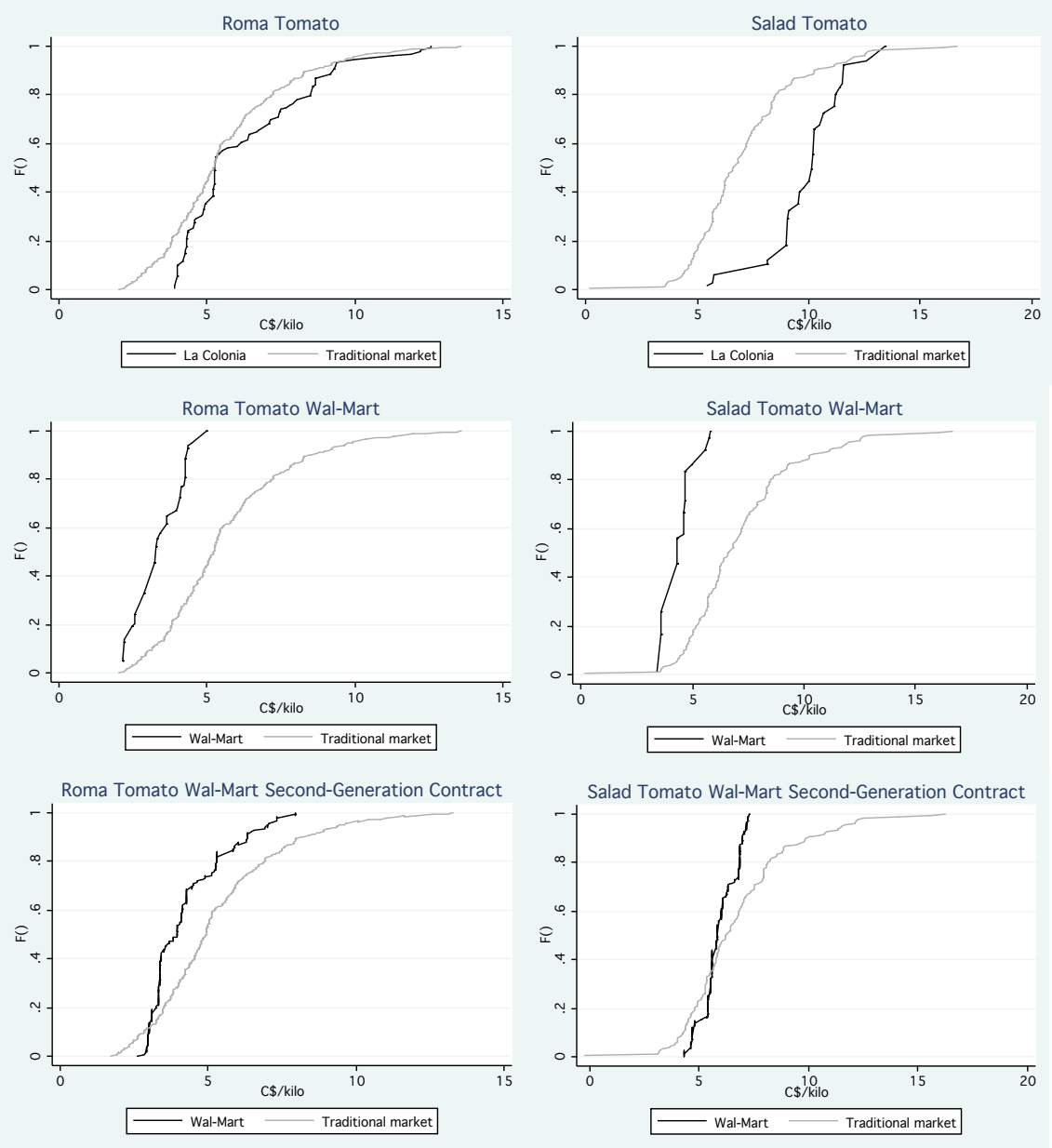

Figure 2.4: First order stochastic dominance tests for roma tomato and salad tomato in La Colonia, and Wal-Mart first and second-generation contracts.

average at the time of sale of the prices in two Managua wholesale markets and a regional market close to the farmer. The three contract types were: an average-price contract in which Wal-Mart pays the average traditional market price; a price-band contract in which Wal-Mart and the farmers fix an upper and lower bound on the average traditional market price and Wal-Mart pays the farmer the lower bound if the average falls below the lower bound and the upper bound if the average market price exceeds the upper bound; and a price-floor contract (introduced in 2008) in which Walmart and farmers fix a lower bound on the average traditional market price and Wal-Mart pays the average traditional market price less 15 percent or the floor price.

Wal-Mart and the Ocotal cooperative negotiated a price band contract in 2007. The minimum negotiated price for roma tomatoes was 3.50 C$/kilo and the maximum 6.20 C$/kilo. The comparison means from the Managua wholesale market during this period was 5.02 C$/kilo and the reported mean farmgate price for roma tomaoes 4.43 C$/kilo (Table 2.3). Salad tomatoes had a negotiated minimum price of 5.52 C$/kilo, and maximum at 8.27 C$/kilo; the Managua comparison mean for salad tomatoes was 6.34 C$/kilo. The 2007 contract also set minimum and maximum prices for sweet bell pepper, small green pepper, jalapeno pepper, cucumber, and baby corn.

Both the price-band contract and the price-floor contract embed an insurance contract; the supermarket eliminates some share of traditional market downside price risk, truncating the lower tail of the traditional market price distribution. Producers pay for the insurance in the form of a reduced mean price. The bottom row of Figure 2.4 plots the CDFs for roma and salad tomatoes for the Ocotal cooperative for the tenure of their relationship with Wal-Mart through May

2008. The two figures in the bottom row clearly illustrate the critical difference between the banded Ocotal contracts and Wal-Mart's supply relationships with the Sébaco cooperative: the truncation of the bottom of the traditional market distribution. Ocotal cooperative farmers reported in March 2008 that they preferred these insurance contracts to the traditional market.[4]

A critical question we address to in the next section is how much farmers are willing to lower their expected mean price with the supermarket in order to truncate their distribution of possible per kilo prices. Do farmers pay too much?

2.4 Estimates of relative risk aversion coefficients

We have established that a primary effect of a supply agreement for small farmers is a reduction in price volatility. The contract reduces uninsured risk exposure that can discourage investment and innovation and risk averse households are expected to be willing to pay a premium to reduce risk exposure. Households have heterogeneous risk preferences; in general, poorer households are more risk averse and are willing to pay more than wealthy households to avoid a monetarily equivalent risk. In the context of our analysis, a higher willingness of poor households to pay to avoid price risk could provide another explanation for the willingness of supermarkets to work with small farmers.

We can determine whether farmers adopting Wal-Mart supply contracts are paying too much for the price risk insurance by using our data to compute the

[4]NGOs assist the cooperatives of this analysis with credit, irrigation, and technical assistance. It could be that the value of such subsidies exceeds the loss of direct mean price difference, creating an artificial net profit not visible to our analysis. This is an interesting critical area for further study.

farmers' minimum relative risk coefficients that rationalize acceptance of the contract. By comparing derived relative risk coefficients with coefficients that have been estimated in the empirical risk literature we can assess the degree of risk aversion implied by preference for the contracts over the wholesale markets. Derived coefficients that significantly exceed ranges in the literature would imply that farmers are accepting a reduction in mean price which is too high.

Greater risk aversion is associated with a more curved utility function. The coefficient of relative risk aversion, R at income Y, is the elasticity of marginal utility at income Y. The dimensionless measure is defined as:

$$R(Y) = \frac{-YU''(Y)}{U'(Y)} \tag{2.1}$$

Newbery and Stiglitz' (1981) Taylor series approximation of certainty equivalent income gives an approximate definition of relative risk aversion: individual i's relative risk aversion is equal to income times two times the risk premium divided by the income variance.

$$R_i(\bar{Y}_i) = \frac{\bar{Y}_i 2\rho_i}{\sigma^2_{Y_i}} \tag{2.2}$$

We assume that the traditional market price p_t is characterized by variance σ^2_t and the Wal-Mart supply channel price is characterized by σ^2_s, with $\bar{p}_t > \bar{p}_s$ and $\sigma^2_t > \sigma^2_s$. The risk premium, ρ_i, is equal to farmers' annual quantity of tomatoes transacted, Q_i, times the difference in mean per kilo farmgate prices between the traditional and supermarket channels. Thus ρ_i is the mean revenue increment the farmer foregoes for the stability of the supermarket channel. We use predicted 2007 household income for $\bar{Y}$, regressing measured 2007 income on the household's vector of assets, geographic controls, and demographic characteristics to generate predicted income $\hat{Y}$. The variance σ^2_Y is the variance in

income attributable to accepting the bet, the price variance in the higher-mean traditional market, var(Qp_t) Equation 2.2 can be rewritten:

$$R_i(\hat{Y}_i) \geq \frac{\hat{Y}_i 2 Q_i(\bar{p}_t - \bar{p}_s)}{Q_i^2 \sigma_t^2} = \frac{\hat{Y}_i 2(\bar{p}_t - \bar{p}_s)}{Q_i \sigma_t^2} \tag{2.3}$$

Equation 2.3 has an intuitive interpretation. The minimum relative risk aversion rationalizing the investment in the supermarket supply chain is increasing in the difference between mean prices and decreasing in the variance of the traditional market and the quantity transacted.

We use household survey data from Ocotal cooperative members who sell to Wal-mart to compute farmer-specific coefficients of relative risk aversion. A second estimate uses farmers who quit supplying supermarkets but continued to grow roma tomatoes.

Table 2.6 presents computed ranges of coefficients of relative risk aversion for farmers with positive 2007 predicted incomes for current suppliers and farmers who left the supply chain (non-suppliers). Coefficient means are somewhat high given estimated coefficients generally range between one and three (Chavas and Holt, 1996; Saha *et al.*, 1994). The distributions of estimated coefficients suggest that some farmers' adoption of supply agreements implies implausibly large coefficients of relative risk aversion.

A second method to assess suppliers' revealed relative risk preferences is to fix R in Equation 2.3 and derive farmers' implied willingness to pay for the new distribution, given R. We assume $R(\hat{Y})$ to be equal to a range of values and estimate the maximum per kilo risk premium ($\bar{p}_t - \bar{p}_s$), the maximum mean price difference between the traditional and supermarket channels that ratio-

nalizes the adoption of the Wal-Mart contract. This per kilo risk premium can be thought of as the farmer's willingness to pay for the insurance against price volatility in the supply contract. We set $R(\hat{Y}) = 1, 2, 3$ – values that have been estimated in the literature using a range of utility functions and specifications (Chavas and Holt, 1996; Saha *et al.*, 1994). Bellemare *et al.* (2009) adopt a similar approach, pegging relative risk aversions coeffients in estimations of crop cross-price risk aversion coefficients.

The bottom section of Table 2.6 presents results from the second, willingness to pay method, in which we set values of relative risk aversion R and compute farmer-specific limits on the per kilo mean price reduction between the traditional and supermarket channel. The true observed per kilo difference in mean price between the traditional and supermarket channels is 2.03 C$/kilo. Therefore, a computed maximum willingness to pay less than 2.03 C$/kilo suggests that farmers at the assumed level of relative risk aversion should reject the contract, given their risk preferences and the price mean implied by the contract. The third and fifth columns of Table 2.6 indicate the percent of farmers (suppliers and non-suppliers) for whom, given the assumed level of risk aversion, the supermarket mean/variance reduction, represents an economically reasonable choice over the traditional market.

Results in the lower half of Table 2.6 suggest that, over an established range of farmer risk aversion, most current supplier farmers' willingness to pay for the price insurance is less than the contract's 2.03 C$/kilo mean price reduction. That is, established levels of relative risk aversion cannot explain the adoption levels that we see.

As expected, as assumed coefficients of relative risk aversion increase in

Table 2.6, the terms of the supermarket price distribution (specifically the reduction in mean price given the reduction in price variance) are attractive to a larger share of both current participants and non-suppliers. Notice comparing columns three and five that the terms of the supply contract are relatively more suited to the non-suppliers – that is, a larger share of non-suppliers at all levels of assumed relative risk aversion would accept the reduction in mean price for the reduction in volatility it implied. Part of what drives the higher relative suitability of the contract terms to the non-suppliers is that the derived maximum mean price reduction ($\bar{p}_t - \bar{p}_s$) is decreasing in income. As a group, the supermarket suppliers have significantly higher incomes than those not supplying supermarkets in Table 2.6 and thus their maximum acceptable reduction in mean price given an assumed level of risk aversion is relatively lower.

Evidence in Table 2.6 suggests some farmers pay a high price for price volatility insurance in the Wal-Mart contract. Two possible explanations might account for participant farmers' estimated high willingness to pay for reductions in price volatility. First, our analysis may be picking up the difference between risk and loss aversion. In prospect theory, an alternative to the expected utility model of choice under uncertainty, loss aversion implies that a material loss has a greater negative effect on an individual's utility than if the same difference were experienced as a gain (Kahneman and Tversky, 1979; Tversky and Kahneman, 1991). If farmers are loss averse, with a strong preference to avoid sharp seasonal price drops, they might have a higher value for the insurance of the contract than our analysis can assess.

A second possibility is that farmers perceive the probability of an extremely low price in traditional markets to be significantly higher than reflected in the

Table 2.6: Derived levels of farmer relative risk aversion and willingness to pay.

Method 1	Ocotal Suppliers n=20	% with $R < 3$	Non-suppliers n=30	% with $R < 3$
Relative risk coefficient (R), mean	4.85		5.39	
Range	0.14–20.09	20%	0.13–29.33	56.67%
Method 2	(C$/kilo)	% rational adopters (wtp>2.03)	(C$/kilo)	% rational adopters (wtp>2.03)
Assuming R=1				
Max mean price reduction, mean	2.23	60%	1.68	50%
Range	0.10–14.62		0.07–16.09	
Assuming R=2				
Max mean price reduction, mean	4.46	60%	3.36	66.6%
Range	0.21-29.24		0.14–32.18	
Assuming R=3				
Max mean price reduction, mean	6.70	70%	5.05	76.6%
Range	0.31–43.86		0.21–48.27	

year-round data collected by the Nicaraguan government. We have shown that farmers adopting supermarket contracts are generally without irrigation at the time of adoption; their experience of horticulture markets prior to the supermarket is seasonal. When farmers adopt supermarket contracts, they are generally moving into year-round production and marketing for the first time.

Producers may base risk assessments on prior marketing experience, likely limited to brief periods of seasonal production characterized by high price volatility. Because traditional seasonal non-irrigated producers of horticultural crops tend to harvest and plant within the same narrow window as one another, they tend to be in the markets when prices are most volatile. If producers remember these market gluts acutely, they may be willing to accept from the supermarket contract a decrease in mean price in order to insure themselves against what is, in fact, a relatively rare event, a price crash in a local or regional market.

If this explanation holds, it would carry implications for the sustainability of Wal-Mart's contract structures and pricing over time. Farmers will update their beliefs about the underlying price distributions over time, learning the true annual price distribution as they switch to year-round cultivation, and their valuation of the contract may change. Moreover, we find that by 2008, 83.3 percent of the 54 supplier farmers in this analysis were equipped with some irrigation. Given supermarkets serve as the spur to move to a more intensive production calendar and investment in irrigation, and given that irrigation systems provide farmers with the capacity to ride out seasonal price fluctuations, it is not clear if, once equipped with irrigation, farmers will continue to value the supermarket contract.

2.5 Conclusions

Research into the consequences and possibilities of the expansion of supermarket operations in Africa, Asia, and Latin America has centered around establishing the economic and institutional conditions under which supply relationships between small farmers and supermarkets take place and documenting the welfare effects of the inclusion and exclusion of smallholders. Research has not yet addressed the mean and variance of the net price paid by supermarkets and traditional markets nor examined the variation in price mean and stability over different contract designs. Finally, no work has examined the cost of reduction of risk in reduced means. Addressing these questions for the first time, our analysis offers a new perspective on the payoffs to participation in supermarket supply channels for farmers.

We find that La Colonia, Nicaragua's domestic supermarket chain offers farmers a market option similar to the traditional market in mean price and price variability. Wal-Mart has pursued a different strategy. To draw in suppliers, Wal-Mart initially employed a pricing method similar to field brokers' prices, which were less than the wholesale market less transport and suggest the existence of supernumerary profits. Wal-Mart took advantage of credit and transport failures that led to this spatial market segmentation, offering terms similar to traditional farmgate buyers. Early Wal-Mart supply agreements were not welfare-improving for the farmer relative to the traditional market – indeed, they were often stochastically dominated by the traditional market.

Beginning in 2007, Wal-Mart changed its supply agreements to provide farmers insurance against the price risks of the traditional market. Farmers

prefer these insurance contracts to the traditional market, and the supply agreements now both provide access to those who did not have market access previously and address the price risk problem in traditional spot markets. However, our analysis suggests that some farmers may be paying too much for this insurance against traditional market price volatility.

Finally, our findings demonstrate that features of the traditional market including spatial segmentation, output price variability, and competition among regional wholesalers affect private contract outcomes. Improved understanding of supply relationships between smallholders and supermarkets can bring new insight into constraints in traditional agricultural markets and contribute to our knowledge of the causes and persistence of rural poverty.

CHAPTER 3

WELFARE EFFECTS OF SUPERMARKETS ON DEVELOPING WORLD FARMER SUPPLIERS: EVIDENCE FROM NICARAGUA

3.1 Introduction

The significant recent growth of supermarket retail in Latin America, Africa, and Southeast Asia (Reardon and Berdegue, 2002; Reardon *et al.*, 2003; Weatherspoon and Reardon, 2003) has implications for the structure and prospects of traditional agricultural markets and production. Academics and policy makers concerned with poverty in the developing world have watched the growth of modern food retail and sourcing with both excitement and trepidation. Supermarket expansion implies the emergence and expansion of new high-value agricultural output markets for the labor intensive crops in whose production small farmers might compete competitively (Bardhan, 1973), but how will they be included in this structural transformation?

Though early evidence suggests that farmers who participate in supermarket supply chains experience higher, more stable incomes (Bellemare, 2009; Key and Runsten, 1999; Minten *et al.*, 2009; Miyata *et al.*, 2009; Neven *et al.*, 2009), significant debate continues over whether and how developing world small farmers might benefit by transitioning from spot market sales with intermediary wholesalers to market transactions with supermarkets. What are the conditions under which small, capital-constrained farmers can participate in these new markets? How do the quality, quantity, and transaction specifications of the supermarket sector require investments in production or post-harvest technologies that, given capital constraints, might exclude the poor? If small farmers do

participate, what are the effects not merely on incomes but on investments likely to change future income dynamics such as household technology adoption and productive assets?

To estimate the distributional consequences of the market transition and to design appropriate policy interventions, we must understand participation in light of the welfare effects of being included or opting out. The bulk of the literature analyzing supply relationships between farmers and supermarkets in developing countries has focused on the determinants of participation at the household level, and on whether there has been exclusion based on farm size or non-land assets.[1] Some research has both anticipated (Barrett and Reardon, 2000; Blandon *et al.*, 2009; Gibbon, 2003; Key and Runsten, 1999; Kirsten and Sartorius, 2002) and identified (Boselie *et al.*, 2003; Dolan and Humphrey, 2000; Reardon *et al.*, 2003) the exclusion of small farmers from supermarket supply chains. Other findings suggest that small farmers are included (Bellemare, 2009; Maertens and Swinnen, 2009; Miyata *et al.*, 2009; Wang *et al.*, 2009) or find that inclusion is confined to those who are already relatively well-capitalized with non-land capital such as irrigation (Hernández *et al.*, 2007; Neven *et al.*, 2009), or those with access through established producer associations (Balsevich *et al.*, 2005). Most extant studies have used cross-sections, matching a group of farmers supplying a particular horticulture crop to a supermarket with a group of similar farmers selling the same crop into the traditional market system.

There has been less rigorous analysis as yet of the determinants of participation at the level of the nation nor has there been research into how geographic characteristics such as community access to infrastructure and water interact with a household's own assets and endowments to influence participation.

[1] Reardon *et al.* (2009) provide an excellent summary on the current state of these debates.

A second gap in the literature has to do with the duration of these supply relationships and also with their termination. To our knowledge, no research has yet examined whether the tenure of a farmer's supply relationship influences welfare outcomes. Nor has any work yet looked at the experience of discontinued suppliers, those that leave the supply chain. Understanding welfare outcomes conditional on duration of the relationship, however, provides insight into the way that supply contracts with supermarkets evolve and the way that effects can be expected to endure should the marketing relationship end.

Finally, extrapolation of supermarkets research to address broader questions of development economics and policy depends on understanding the specific pathways through which supermarket supply relationships affect participant welfare. The analysis of technologies by channel choice (Balsevich *et al.*, 2005; Hernández *et al.*, 2007) explores one possible mechanism, but other plausible candidate mechanisms include: increases in prices in the supermarket supply chain, increased market price stability permitting increased investment in production and increased quantities, increases in productivity, and increased credit access.

The empirical challenge of estimating welfare effects attributable to participation is the potential endogeneity of the observed outcomes. Welfare outcomes measured as effects of participation may be jointly determined by observables influencing placement of the supply chain such as access to water and infrastructure, or unobservables influencing household participation such as entrepreneurial or management ability. Apart from Bellemare (2009), who use an instrumental variables approach, all of the aforementioned studies use Heckman two-step selection corrections, estimating channel participation in the

first stage and welfare effect in the second. As Reardon *et al.* (2009) point out, few of the existing cross sectional studies are able to control for participant asset stocks and landholdings at the time the farmer entered the supply relationship; thus there remains some interpretive ambiguity surrounding evidence on the welfare effects of joining supply chains.

This research makes three primary contributions to the empirical literature on the effects of the expansion of supermarkets in the developing world on small farmers. We show that geographic and natural resource endowments are significant predictors of community inclusion in a supermarket procurement basin. Conditioning on this supply chain placement, instrumental variables analysis is used to control for the farmer selection effect and also to estimate the effect on a set of welfare variables (including household per capita incomes, irrigation, and productive assets) from supplier arrangements with supermarkets. Our approach is the first to instrument for three dimensions of participation in supermarket supply chains: current supplier status, tenure of farmer participation in the supply chain, and discontinued supply relationships. We use a combination of instruments in our three first stage equations: the length of the farmer's longest relationship with buyers purchasing horticulture crops, the length of time a farmer has grown a crop that is a non-basic grain nor a cash crop, the distance from the closest retail outlet in the year 2000, and the amount of land worked by the farmers' parents.

We find positive statistically and economically significant effects on participant farmer incomes, productive assets, and irrigation. We find evidence of a growth effect, larger effects on incomes and productive assets accruing to farmers with longer tenure supply relationships. Our evidence suggests that these

income and productive asset increases are retained by farmers who exit the supply chain. In addition, we find a significant positive level effect on irrigation investment for suppliers and a corresponding negative effect on the irrigation investment of exited farmers. Farmers who joined the supply chain through NGOs invest significantly higher levels of irrigation and productive assets.

Finally, household survey data is used to investigate three candidate mechanisms that might drive these positive effects: the supermarket supply agreement loosens the liquidity constraint; the supermarket supply agreement increases agricultural productivity; or the relationship spurs farmer investment. We find evidence that the supply contract is associated with increased farmer access to credit. This credit, combined with price insurance of the contract, permits increased farmer investment in horticulture.

We begin with a description of the data and the critical starting asset and irrigation positions of participant farmers. The third section presents a simple model to build intuition for our estimation of determinants of supply chain placement and farmer selection. Section Four estimates the placement model. Section Five explains the instrumental variables strategy and Section Six presents the results from the welfare effect estimations. Section Seven examines three candidate mechanisms that might drive welfare effects. The final section concludes.

3.2 Data

Because this research is designed to characterize and estimate the selection mechanism, supply chain placement, and welfare effects of supply chain partici-

pation at a national level, our strategy was to locate and survey all small farmers who had sold to supermarkets in the country since 2000. Two retail groups dominate Nicaragua's domestic supermarket sector, the 10-store national chain La Colonia and Wal-mart, with 46 Nicaraguan outlets. Michelson *et al.* (2010) and Balsevich *et al.* (2005) describe the sector, the evolution of respective procurement structures and the rapid growth in retail and sourcing in the Nicaraguan supermarket sector since 2000.

Using interviews with current and former buyers, non-governmental organizations (NGOs) working in agriculture, and farmers' organizations, we compiled lists of communities and municipalities in Nicaragua defining supermarket procurement basins. Nicaragua is made up of 153 municipalities (districts). Of these, we determined that 73 contained communities where farmers either had supplied supermarkets or might plausibly supply supermarkets due to proximity to supplier municipalities or the primary road network.

Current and discontinued suppliers

We used our compiled lists of supplier communities to conduct a supplier census, identifying all farmer supermarket suppliers of fresh fruits and vegetables. Teams began in communities where we knew supermarkets had sourced – in these communities enumerators compiled names of current and past suppliers and assembled names of additional communities where supermarkets had purchased. If supplier communities named by interviewees were not already included on our list, census teams visited these communities as well. Teams assembled information including supplier name, supermarket(s) supplied, dates of participation in the supermarket supply chain, and crops supplied.

Upon the completion of the supplier census, enumerator teams returned to all farmers located in the supplier census and conducted a detailed household survey with the household head. All supplier farmers were surveyed.[2] We interviewed 425 farmers who had supplied supermarkets in Nicaragua.[3]

Non-supplier sample

As a comparison population for a welfare analysis of supermarket suppliers, we need a representative sample of farmer households in regions of Nicaragua where supermarkets source fresh fruits and vegetables – geographically and agro-climactically plausible suppliers.

For this comparison sample, we draw on an existing panel, a collaboration between the Nicaraguan Agricultural Ministry and the Food and Agriculture

[2]As a method of capturing the population of farmers supplying supermarkets, the census technique has three potential sources of error. First, if supermarket sourcing strategies have experienced punctuated geographic changes since 2000 such that there is no overlap between the source community regions in 2008 (the year of our survey) and the source communities before 2008, our technique will not adequately characterize the pre-2008 set of suppliers. We do not anticipate this being a problem for two reasons. Limited regions of the country permit continuous or semi-continuous production of fresh fruits and vegetables, effectively preventing the sort of geographic discontinuity about which we might worry. We also benefit from the youth of the supermarket trends in the country. Nicaragua's "supermarket period" began relatively recently in 2001 – using farmer recall data, we can plausibly capture the whole arc (thus far) of supermarkets' strategies and small farmer involvement. A second potential error source is that farmers must self-identify as supermarket suppliers. That is, for our method to have located a farmer he must know that his production is going to a supermarket. What we term "passive participants", farmers unaware that they sell to intermediate wholesalers who then sell to a supermarket, will not be captured by the census. Because Wal-mart designs its supply network to eliminate middlemen and purchase directly from the farmer, this is not anticipated to affect our accuracy in capturing the Wal-mart supplier network. Finally, our strategy is more likely to capture farmers with ongoing or periodic transactions with supermarkets rather than farmers engaged in infrequent once a year or twice a year sales to supermarkets. Since 2000 both supermarkets have pursued a strategy of establishing sustained relationships with their suppliers. Farmers with infrequent transactions are often of a seasonally demanded or supplied annual crop such as papaya, mango, or sugar cane. A sample favoring active suppliers engaged in multiple transactions with supermarkets potentially biases upward our estimate of welfare effects if we assume that supply relationships become increasingly profitable, for example decreased costs through improved coordination, through repeated interaction.

[3]Of these 425 surveyed households, 29 were incomplete, leaving us with 396 complete interviews.

Organization (FAO), with observations in 1996 and 2000. The original 1996 study followed a nationally representative area-based sampling procedure in which every piece of land in Nicaragua was given equal weight in the random selection of 1,450 plots, excluding the departments of the Atlantic Coast and all production units exceeding 500 manzanas (approx. 350 hectares).[4] None of these excluded areas are within supermarket procurement basins. In 2000, researchers from the World Bank in collaboration with the University of Wisconsin and a Nicaraguan NGO revisited the original 1,450 households. They were able to locate 1,350 of the original households.

Because we needed a control group of representative potential suppliers farming under similar agro-climactic conditions and with analogous proximity to supply routes, we restricted our re-survey of the panel to only the municipalities in which we knew that farmers had supplied supermarkets or might plausibly supply supermarkets because of proximity to primary road networks and supply municipalities.

There were 640 farmers in the panel living in established or plausible supply municipalities. We successfully located and interviewed 466 of these farmers. Our attrition rate was 25.9 percent.[5]

[4]One Nicaraguan manzans is equal to 0.7 hectares.

[5]We were most successful locating and interviewing farmers living close to major roads. A final potential sources of sampling bias: because we conducted a survey of farmers using an area-based sample, our farmer sample will have a bias towards inclusion of farmers with multiple plots. Because our control group therefore is biased towards larger farmers (farmers with multiple plots) proximate to roads, our sample is likely biased towards farmers with a higher proclivity towards participation in supermarket channels. Because our control is likely to comprise wealthier farmers with higher market participation, it is a more suitable comparison for our treatment group. Our results of effects on incomes and irrigation are only strengthened.

3.2.1 Describing the suppliers

A first step toward understanding effects of participation in supermarket supply chains is establishing the circumstances of suppliers before they began supplying. We have extremely rich recall data on supplier productive assets, market participation, and production. In this section we use descriptives to characterize the production and market behavior of suppliers before they sold to the supermarket and to build some intuition for the depth and breadth of a suppliers' relationships with supermarkets. Is the supermarket recruiting from a relatively technologically sophisticated population of horticulturalists or are suppliers drawn from the population of smallholders concentrated in basic grains production?

Our sample consists of 466 nonsuppliers, 231 continuous suppliers and 152 discontinued suppliers who both entered and exited the supply chain between 2001 and 2008. Table 3.2.1 disaggregates the 396 suppliers by the supermarket chain supplied and presents the mean relationship tenure, both by chain and by whether the farmer exited the supply chain or was still a supplier in 2007. The mean supply relationship for suppliers still working with a supermarket in 2008 was a little over two and a half years and discontinued suppliers a little more than one and a half years. Our samples of both current suppliers and discontinued suppliers are dominated by farmers supplying Wal-Mart (or Wal-Mart's predecessor, Ahold).[6] Few farmers supply multiple chains simultaneously, in fact Wal-Mart has policies actively discouraging its supplier farmers from working with the company's competition.

[6]The supermarket category Other in Table 3.2.1 is mostly the retailer PriceSmart, which has one store in Managua. The category Multiple largely consists of farmers who moved from supplying Wal-Mart to supplying La Colonia.

Contracts are generally verbal agreements specifying quantities of specific quality product to be purchased from the farmer by the supermarket buyer at a future date or according to a future schedule. Prices at the date of the transaction are often set explicitly or set with respect to reference traditional markets; minimum prices are also often set, so the farmer knows the lowest possible price that he will receive for his production. In the case of NGO-organized farmers, a written contract is sometimes negotiated with the NGO for a specified aggregate quantity and purchasing schedule.

Table 3.1: Mean duration of supply relationship, by supplier status and supermarket chain

	n	Mean supply relationship duration (years)	(s.d.)	min	max
Wal-Mart					
Current suppliers	168	2.70	(1.94)	0	7
Discontinued suppliers	144	1.67	(1.33)	1	7
La Colonia					
Current suppliers	34	2.88	(1.95)	0	7
Discontinued suppliers	2	1	(0)	1	1
Other					
Current suppliers	10	1.9	(1.29)	1	4
Discontinued suppliers	6	2.17	(2.40)	1	7
Multiple					
Current suppliers	32	3.69	(2.01)	1	7
Discontinued suppliers	0				
Total	396				

Pre-supermarkets, suppliers are an extremely heterogeneous set, cultivating a range of crops with a variety of technologies and production intensities. Table 3.2 distinguishes between farmers who grew basic grains before supplying

the supermarket, farmers who were already growing the crop that they would ultimately sell to the supermarket, farmers that both grew basic grains and the sourced crop before supplying, and farmers who grew neither (mostly coffee or cash crops). One hundred thirty-two farmers grew basic grains but not the supply crop (33.3 percent of all suppliers) while 208 (52.5 percent) suppliers had some experience growing the crop they were ultimately contracted to supply to the supermarket. However, more than three-quarters of all suppliers (and three quarters of all suppliers with some experience growing the sourced crop before the contract) were rain-fed, without irrigation, prior to the supermarket. Evidence in Table 3.2 suggests that, though more than fifty percent of suppliers had some prior experience growing the supplied crop, many were not growing at the scale or the frequency required by the contract. Farmers who grew basic grains and not the supply crop prior to the contract are mostly farmers who entered the supply chain through NGO projects. Farmers in our sample have supplied a wide range of horticulture including: tomatoes, lettuce, small green peppers, cabbage, cucumber, onion, broccoli, fresh herbs, carrots, beets, green beans, radish, etc.

Table 3.2: Supplier production and irrigation prior to supermarket supply contract.

	Basic grains only	Supermarket crop only	Both	Other	Total
Irrigation before becoming a supplier	32	28	24	11	95
No irrigation	100	84	72	45	301
Total	132	112	96	56	396

Once these largely rainfed farmers enter the supermarket supply chain, neither their production nor their marketing behavior is exclusively concentrated in the supermarket relationship. Data from 2007 suppliers indicate that the majority supplied one crop to the supermarket while selling two crops in non-supermarket markets and growing a mean of four crops. Discontinued suppliers grow and market, on average, the same number of crops as current suppliers. Table 3.2.1 presents the mean total number of crops grown and total number of crops sold by suppliers in 2007, disaggregated by the number of crops the supplier sold to the supermarket in 2007. Non-suppliers grow and market a significantly smaller number of crops than current or discontinued suppliers.

The crops gown by suppliers and the transaction frequency described in this section suggest that farmers will need access to the resources, geographic and household, to permit extended production schedules. A plausible selection model and empirical strategy therefore must consider place and household characteristics simultaneously, a task to which we now turn.

3.3 Modeling farmer supermarket channel participation

To our knowledge, our data is the first to characterize a national population of supermarket suppliers. These unique data allow us, for the first time, to examine the place determinants of supply chains and the way that site characteristics interact with household asset endowments. While previous research has focused on the study of participation of a subset of supermarket suppliers concentrated in the production of one or a small set of crops, our dataset of 396 suppliers and 466 non-suppliers spans a wide range of crops, geographic, and

Table 3.3: Total crops grown and sold by suppliers in 2007, disaggregated by quantity sold to the supermarket in 2007.

heightCrops sold to supermarket	n	Total crops grown (2007 mean)	Total crops sold, all markets (2007 mean)
Supplied 1 crop in 2007	156	4.32	2.29
Supplied 2 crops in 2007	54	4.72	2.78
Supplied 3 crops in 2007	20	6.45	3.70
Supplied 4 crops in 2007	1	14.00	5.00
Non-suppliers	466	2.74	1.40
Discontinued suppliers	152	4.08	2.62
Total farmers	849		

agro-ecological conditions.[7]

Establishing household and community determinants is critical to welfare effect estimation but interesting in its own right because we disentangle participation/eligibility at the community level from eligibility at the household level. Participation in these opportunities is clearly not equally available to everyone, even when our analysis is restricted to regions of established supermarket procurement. Road and water access, in particular, matter a lot.

Because we consider the spatial and agro-climactic determinants of participation in a new market opportunity, this work relates in context and intent to the literature on geographic poverty traps. In the macro growth literature, cross-country studies have examined the role of geography on the terms and

[7]Our nationally representative sample is limited to regions where we determined that supermarkets had been purchasing, so our characterization is already conditional on farmers living in municipalities of established supermarket procurement activity.

rates of countries' economic development (Bloom and Sachs, 1998; Gallup *et al.*, 1999; Sachs and Warner, 1997). Evidence on geographic poverty traps within countries is relatively less developed. Jalan and Ravallion (2002) use household panel and geographic data and a model of household consumption growth that permits estimation of time-invariant geographic effects to establish the existence of geographic poverty traps in rural China.

Our work contributes to the geographic poverty traps literature by studying circumstances in which geographic externalities affect the returns to private capital, investments by farmers in technologies that increase and stabilize production. In the case of supermarket supply chains, adoption of technologies and new markets may only pay if there are proximate roads and constant water access.

3.3.1 Motivation

Two issues underlie our strategy for estimation strategy: nonrandom supply chain placement and unobserved household selectivity effects that might influence both participation outcomes and the likelihood of individual participation. This section lays out a simple analytical framework based on intuition gathered from qualitative evidence on the placement and selection mechanisms that guide supermarket channel participation.

Given that what is not observed is as important to an analysis of participation and welfare effects as what can be seen, it is useful to think in terms of the sequence of the supply agreement. Figure 3.1 maps a simple chronology of participation in which a supermarket sites its supply chain in community j,

identifies and approaches farmer *i* (in community *j*) and farmer *i* accepts or rejects the supply agreement. Only if a farmer accepts a supply agreement do we observe the duration and depth of that supply relationship.

We do not observe farmers who refused the supermarket supply agreement offer.[8] Note that the choice of community and farmer might be simultaneous; they are separated in the figure for the purposes of exposition.

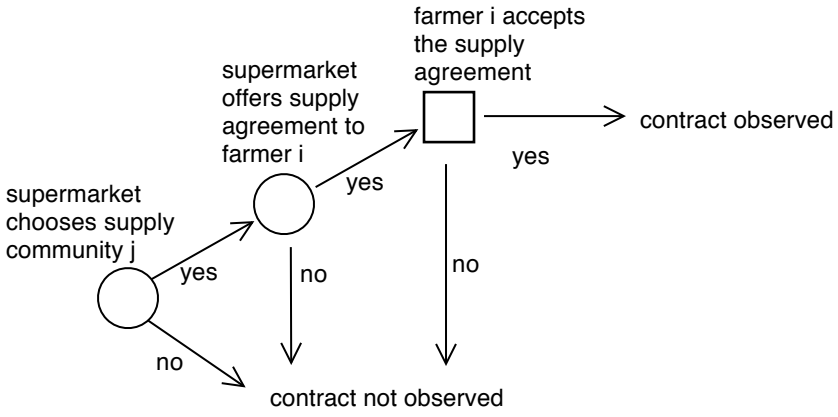

Figure 3.1: Sequence of decisions determining farmer supermarket channel participation.

Farmers enter into a supply relationship with a supermarket through a variety of pathways. Some farmers enter through NGOs that prioritize transitioning basic grains subsistence smallholders into horticulture, some enter through NGOs that set minimum landholding thresholds, others are incorporated when a supermarket buyer driving a supply route extends an invitation to a farmer with a healthy-looking field of tomatoes. The heterogeneity in entry pathway is an important part of our identification strategy.

Interviews with Wal-mart supermarket produce buyers charged with meet-

[8]The sequence of observation mapped in figure 3.1 and the subsequent simple model can accommodate the case in which the supermarket simultaneously chooses the farmer and the community.

ing weekly regional horticultural supply quotas indicate that buyers value two primary attributes: farmers who are easily accessed by roads and telecommunications; and farmers with the agroclimactic and economic potential to provide a year-round supply stream. Even an extremely well-capitalized farmer living hours off of the primary road network would be a poor choice for a supplier if the transactions costs outweighed the marginal benefit of his supply. Similarly, a farmer living in a highly productive agricultural zone but lacking sufficient liquidity and access to capital to fund a stable supply stream might not participate.

Preliminary analysis makes clear that suppliers are on the whole a selected group characterized by the access roads and communications and to the financial and agro-ecological resources to permit stable, year-round output.

3.3.2 Analytical model

A simple model based on the preceding intuition informs the empirical specification. Participation of a farmer in a supermarket supply chain is expected conditional on a set of community characteristics Z_j and household characteristics X_{ij}.

The supermarket buyer is looking for a supplier to provide quantity q of a crop. He adds farmer i to his portfolio of suppliers if the marginal benefit of adding the supplier exceeds the marginal cost of adding the supplier. The marginal benefit of adding the supplier is a function of the per unit retail price, p_r, of the crop and quantity of units sourced, q, and price terms of the contract, $MB_{ij} = k(p_r, q)$.

The marginal cost of adding the buyer is the additional costs of negotiation, transportation, and coordination. These costs are a function of the characteristics of the community, Z_j and the individual farmer X_{ij}: $MC_{ij} = C(Z_j, X_{ij})$

The supermarket offers the supply contract consisting of a mean price, a price variance, and a quantity $(\bar{p}_s, \sigma^2_{ps}, q)$ to farmer i if this contract generates non-negative surplus for the buyer,

$$S_{ij} = k(p_r, q) - C(Z_j, X_{ij}) \geq 0. \tag{3.1}$$

The likelihood of a supermarket offering a supply agreement to farmer i can be written as a function of community and individual characteristics and a threshold $\tilde{k}$, $S(\tilde{k}, Z_j, X_{ij})$. Because $\tilde{k}$ can be treated as a constant in the short term $S(\tilde{k}, Z_j, X_{ij})$ can be written $S(Z_j, X_{ij})$. We assume that the mean retail price is as least as high as the contract price $\bar{p}_r \geq \bar{p}_s$.

Conditional on being offered a contract, $S(Z_j, X_{ij}) \geq 0$, the farmer decides whether to accept the supply agreement. Farmer i's decision is derived from expected utility maximization. Assume the farmer is an expected utility maximizer with a von Neumann Morgenstern utility function that is concave in wealth. The household chooses consumption of an n-vector of production and marketing inputs (x) to maximize expected utility:

$$max_x E[U(w_0 + \pi] \tag{3.2}$$

where π is profit:

$$\pi = pf(x) - r'x.$$

With r' representing a corresponding n-vector of input prices, w_0 initial

wealth and with a strictly concave production function $f(.)$ and α a vector of farmer preference parameters.

In the default, pre-contract case, $p = \bar{p} + e$ represents stochastic output price, with $E(p) = \bar{p}$, $E(e) = 0$ and σ_p^2 denotes the second central moment of the output price distribution. The farmer expects price p in the traditional market and p_s in the supermarket. A previous paper on supermarket supply agreements in Nicaragua could not reject the hypothesis that the traditional market and supermarket pay equivalent mean prices (Michelson *et al.* 2010). Instead, the contract was found to reduce price variance compared with the traditional markets. Therefore, assume equivalent means across traditional and supermarket channels $\bar{p} = \bar{p}_s$ but that the supermarket contract offers a lower output price variance because it truncates the traditional market price distribution, $\sigma_{ps}^2 \leq \sigma_p^2$.

Assuming that utility and production technology functions are twice continuously differentiable, it is possible to characterize the solution to the farmer's expected utility maximization:

$$x_i = x_i^*(\bar{p}, \sigma_p^2, w_0, r, \alpha), i = 1, ..., n, \tag{3.3}$$

And characterize the resulting value of expected utility,

$$V(x) = V(\bar{p}, \sigma_p^2, w_0, r, \alpha). \tag{3.4}$$

The added production and/or marketing cost that the farmer incurs from participation in the supermarket supply chain is written as a function of community characteristics Z_j and household characteristics X_{ij}, $c(Z_j, X_{ij})$. The value

of farmer expected utility under the supermarket can then be written:

$$V_s(x) = V(\bar{p}_s, \sigma^2_{ps}, w_0, r, \alpha, Z_j, X_{ij}). \tag{3.5}$$

The farmer accepts the supply agreement if

$$V_s(x) \geq V(x) \tag{3.6}$$

Which can also be written:

$$D = \begin{cases} 1 & \text{if } V(\bar{p}_s, \sigma^2_{ps}, w_0, r, \alpha, Z_j, X_{ij}) \geq V(\bar{p}, \sigma^2_p, w_0, r, \alpha); \\ 0 & \text{otherwise.} \end{cases}$$

To begin, assume that participation in the supermarket supply chain is costless to the farmer $c(Z_j, X_{ij}) = 0$. If the farmer is risk averse, then expected utility with the supply agreement V_s will always be greater than expected utility without the supply agreement because accepting the agreement reduces the variance in the output price, and $V(.)$ is decreasing in σ^2_p for net sellers (Sandmo, 1971).

However, costless participation in the supply chain does not appear to be the norm. Farmers tend to increase expenditure related to post-harvest preparation of the crop in accordance with supermarkets' product quality and transaction standards. Generally, $c(Z_j, X_{ij}) > 0$. Once nonzero costs of participation are introduced, acceptance of the supply agreement is determined by the farmer's degree of risk aversion (captured in α), his starting wealth, the vector of input prices, the mean and variance of the supermarket price distribution ($\bar{p}$, σ^2_{ps}) and the traditional market distribution ($\bar{p}$, σ^2_p), and the specific cost of participation determined by his household and community characteristics.

$$D(\bar{p}_s, \sigma^2_{ps}, \bar{p}, \sigma^2_p, w_{i0}, r, \alpha_i, X_{ij}, Z_j) \tag{3.7}$$

This simple reduced-form characterization of the choice function $D(.)$, which captures decisions by the firm and the farmer, suggests that both household and community characteristics belong in our participation equation. For simplicity, we assume that farmers face the same supermarket output price distribution and input prices and that risk aversion is a function of individual period $t = 0$ wealth, w_{i0}. We can rewrite $D(.)$ as

$$P(D_i = 1) = \Phi(w_{i0}, X_{ij}, Z_j) \tag{3.8}$$

Our specification is similar to Sadoulet and de Janvry (Sadoulet and de Janvry, 1994), who derive input demand functions from the profit function that are functions of output prices, input prices, risk factors, quasi-fixed capital, and shift-factors like location.

The resulting specification $D_i(.)$ describes a potential tension regarding the influence of initial household wealth, w_0 on farmers' participation in supermarket supply chains. Risk averse households should be (and results in Michelson *et al.* 2010 suggests that they are) willing to pay some premium to reduce price risk in the traditional output market. Theory suggests (Stiglitz and Newbery, 1981) that poor households will be more willing to pay a fixed amount to lessen the magnitude of a given risk than wealthier households, particularly if access to credit to permit household consumption smoothing in the face of unexpected fluctuations in income is increasing in wealth.We would expect the poorest farmer households to most value the supermarkets' partial insurance against instability in output market prices. However, the poorest farmers are likely to be those least equipped to meet the quantity, quality, and transaction requirements of the supply contract. The net effect of starting wealth on partic-

ipation, therefore, is not clear.

3.4 Supply chain placement

Our unique data permit the characterization of factors that have determined entry into the supply chain at the national level since 2000. We use this date to determine farmer participation in supermarket supply chains across the heterogeneous set of inclusion pathways and supplied crops.

In this section we run four models, over site and households separately and then together. We observe 496 communities. Of these, 356 are non-supplier communities, 49 are discontinued supplier communities (where at least one individual sold to a supermarket between 2000 and 2007 but in which all suppliers had discontinued their relationship with the supermarket by 2008), and 91 are current (2008) supplier communities in which at least one individual surveyed in that community reported that he or she had sold a crop to a supermarket in 2007. Communities are defined administratively, by the name of the resident community given by the farmer. Based on interviews with supermarket buyers and intuition from the model in the previous section suggesting that community characteristics influence supply chain placement through influence on the fixed and per-unit costs of the transaction for farmer and buyer, we hypothesize that several classes of characteristics may determine a community's inclusion in a supermarket supply basin.

First, communities without capacity to supply year round are regions of high cost contracts because the fixed costs of the contract for the buyer are spread over a smaller number of transactions and growing seasons. Therefore, vari-

ables capturing agro-climactic possibilities for year-round cultivation including the altitude, the depth of the water table, and whether the community has water to support agriculture throughout the year are expected to positively influence whether a community is contained within the supply chain basin and we expect supply communities to have higher altitude (reflecting higher historical horticulture production in the country's interior highlands), shallower depth of water table (to permit easy well drilling for irrigation), and higher access to water throughout the year for agricultural production.

In addition, supermarket buyers report a preference for farmers with whom, whether because of proximity to main roads or access to communication technologies, they can maintain a flexible supply relationship – updating quantities, prices, and timing in the week before a transaction. In our framework, these are community attributes that would increase coordination and reduce the cost of the contract to both parties. We therefore expect that variables capturing the isolation of the community including distance to a paved road, distance to the closest municipal market, distance to the closest supermarket retail outlet, will be smaller for participant communities and should negatively influence community inclusion. Conversely, community cell phone access in 2007 should be higher for included communities and is expected to positively influence supply chain placement.

Finally, in 2005, the United States Agency for International Development (USAID) initiated a partnership with four non-governmental organizations (NGOs) operating in Nicaragua. The goal of this project was to facilitate small farmer supplier relationships with supermarkets. A final variable likely to positively influence community participation in supermarket supply chains, there-

fore, is the presence of these NGOs operations in the community's municipality in 2005.

Table 3.4 compares means for community altitude, depth of water table, year-round access to water for agricultural production, distance to paved roads, the closest municipal market, and the closest supermarket retail outlet, years of cell-phone access, and 2005 municipal activity of the NGOs Save the Children, Adventist Development and Relief Agency, Catholic Relief Services, and Project Concern International in supply and non-supply communities. In communities containing multiple households, responses were averaged across residents. All variables are time-invariant or pinned to 2000 levels. We take the full 2008 set of supplier communities and households and determine what 2000 (pre-supermarket) attributes predict supply chain siting and household participation.

On the majority of community characteristics related to accessibility and potential for steady agricultural production in Table 3.4, current supply communities differ significantly from non-supply communities. One odd difference between the groups in Table 3.4 is in participant distance to market. Contrary to our expectations, participant communities are significantly further from markets than non-supply communities. All other differences are consistent with our expectations.

Table 3.4 also demonstrates that there are significant differences between current supply communities and in discontinued supply communities. In altitude, USAID NGO operations in the community municipality, and distance to the closest supermarket retail outlet in 2005, current suppliers differ from discontinued suppliers. It is interesting to note that we cannot reject the equiv-

alence in mean distance to the closest supermarket across suppliers and non-suppliers in 2000 but suppliers are located closer, on average, to a retail outlet than both non-suppliers and discontinued by 2005.[9] Several possible explanations exist: Wal-Mart may have selected suppliers proximate to new outlets or built outlets in spots proximate to suppliers or there may be regions or sub regions whose characteristics jointly influence their desirability as locales for retail and supply.

Table 3.4: Summary statistics for supplier communities, discontinued supply communities, and non-supplier communities.

	Non-supply community	Discontinued supply communities	Current supply community (2008)
Altitude (log mts)	5.84	5.91	6.32[a,b]
Mean well depth (log mts)	3.48	2.96	3.21[a]
Distance to paved road (log km)	1.43	1.49	1.37
Distance to market (log km)	2.30	2.64	2.53[a]
Water year round (1=yes)	0.28	0.62	0.68[a]
Cellphone access in 2007 (1=yes)	0.65	0.63	0.77[a,b]
USAID NGO operations in municipality in 2005(1=yes)	0.39	0.63	0.78[a,b]
Distance to closest supermarket retail outlet:			
in 2000 (log km)	3.23	3.21	3.41
in 2005 (log km)	2.70	2.70	2.41[a,b]
n	356	49	91

Current supplier communities statistically significantly different at least the 10% level from:
[a]Non-supply communities
[b] Discontinued supply communities

[9]Significant growth has occurred in the number of supermarket stores in Nicaragua in the last decade; in 2000 the two major companies had 24 retail outlets combined in the country but by 2008 there were 60 stores. Most of the increase had been in Wal-Mart's holdings, mostly outside of Managua.

Our theory suggests that both community and household characteristics influence household participation. Based on interviews with NGOs, buyers, and intuition from the supermarkets literature (Balsevich *et al.*, 2005; Hernández *et al.*, 2007) and our model, several household characteristics are expected to influence participation in supermarket supply chains. Given the costs and complexity associated with standards and transaction requirements and given supermarket payment delays of between one and three weeks, it is anticipated that farmer participation is positively associated with 2000 wealth, but the effect of wealth is difficult to predict, given that we have also hypothesized that the price risk-mitigating terms of the contract are likely to be more attractive to relatively poorer farmers. Farm size and land accumulation (between 1992 and 2000) are expected to be negatively associated with participation because larger farmers in Nicaragua generally work in highly remunerative large scale cash crops such as sugar cane, sesame, coffee, plantains, rice, sorghum, and peanuts. Because supermarket buyers report a strong preference for farmers who can provide steady, year round supply streams, a farmer's irrigated landholdings are expected to positively influence inclusion.

We include four variables related to farmer experience. First, we include a farmer's total farming experience. Second, we include a variable that captures the years a farmer has grown a supermarket sourced crop. Supermarkets source a wide range of crops in Nicaragua, and the variable measures the farmer's longest experience growing any supermarket sourced crop; the farmer need not have ever sold the crop to a supermarket. For example, a non-supplier who has grown tomatoes for five years and cucumbers for 15 would have a value of 15 for this variable while a supplier who has grown squash for 30 years for sale in the traditional market and peppers for two years to in a supply chain would

have a value of 30. The final two variables related to experience capture farmers' experience in markets: the farmer's longest-running relationship with the buyer (at farmgate, regional market wholesaler, exporter, central Managua market) of a non-supermarket crop (anything from beans to sugar cane to coffee) and the farmer's longest-running relationship with the non-supermarket buyer of a supermarket crop. We expect total experience and length of relationship with a buyer of a non-supermarket crop to be negatively associated with participation while variables related to the production and marketing of supermarket supply crops are expected to be positively associated with household participation in supermarket supply chains.

Demographic characteristics include: age, gender, and education of the household head. Research has established a relationship between household head education and technology adoption, and we expect to find the same relationship. We use two variables to capture family labor availability in 2008: the number of adults and children in the household. The effect of total family size on participation is difficult to predict; family labor resources in what are generally labor-intensive crops would be positively associated with participation but larger families are also often poorer, with more material demands and perhaps less liquidity to finance intensive horticulture production.

Table 3.5 presents summary statistics for these wealth, demographic, and experience variables. As in Table 3.4, we compare current (2008) suppliers with both non-suppliers and discontinued suppliers. Assets are compiled into an index using factor analysis, (Sahn and Stifel, 2000); we include details regarding computation of the asset index in the first appendix. Incomes are not observed in 2000 for current or discontinued suppliers, and are not included in Table 3.5.

Table 3.5: Household summary statistics for suppliers, discontinued suppliers, and non-suppliers

	Non-supply household	Discontinued supplier household	Current (2008) supplier
Productive wealth			
Productive asset index, 2000	-0.26	-0.13	-0.38[a,b]
Consumer durables index, 2000	-0.37	-0.38	-0.46[a,b]
Landholdings, 2000 (mzs)	18.72	11.78	6.17[a,b]
Land Accumulation, 1992-2000 (mzs)	0.28	3.42	1.72
Irrigation, 2000 (mzs)	0.05	0.26	0.26[a]
Demographics			
Age of household head (years)	58.58	47.78	44.59[a,b]
Education of household head (levels 1-8)	2.10	2.45	2.71[a]
Gender of household head (1=male)	0.20	0.08	0.04[a,b]
Kids in the household (age< 16)	1.31	1.43	1.75[a,b]
Adults in the household	3.70	3.45	3.24[a]
Experience			
Farming experience (years)	22.71	17.28	14.81[a,b]
Longest relationship with non-horticulture buyer (years)	7.13	4.43	3.06[a,b]
Longest relationship with horticulture buyer (years)	1.61	5.76	4.38[a,b]
Years growing a horticulture/tuber crop (years)	4.07	8.85	8.76[a]
n	466	152	232

Current supplier households statistically significantly different at least the 10% level from:
[a]Non-supply households
[b] Discontinued supply households

On the majority of household characteristics related to endowed wealth, experience, and and growing potential, current supplier households differ significantly from both and non-supply households and discontinued supply households. As expected, suppliers had significantly lower mean landholdings in 2000 and were significantly younger and with significantly less experience than either non-suppliers or discontinued suppliers. Moreover, their longest marketing relationship for a non-supermarket sourced crop was significantly shorter than either non-suppliers or discontinued suppliers. Surprisingly, current suppliers had significantly lower 2000 indices than either non-suppliers or discontinued suppliers for both productive assets and consumer durables.

Regarding household irrigation in 2000, household head education, and production experience with a supermarket-sourced crop (before the supermarket arrived), suppliers and discontinued suppliers are more similar to each other than either group is with non-suppliers. We cannot reject the equivalence in mean irrigation holdings for non-suppliers and discontinued adopters, but these groups had significantly higher 2000 irrigation holdings than non-suppliers. We find for education of the household head and years growing a supermarket-sourced crop are similarly higher for current suppliers than non-suppliers but we cannot reject the equivalence in means for these variables across current and discontinued suppliers.

Table 3.6 reports the marginal effects at the sample mean of the probit regression for four related specifications. Models (1)–(3) use supplier as the dependent variable, grouping current suppliers and discontinued suppliers in a single group containing all farmers who have supplied supermarkets in Nicaragua since 2000. We group current and discontinued suppliers together into total sup-

pliers in order to characterize the determinants of community and household inclusion, rather than tenure or retention. In Model (1) we regress only community characteristics from Table 3.5 on supplier status of farmers. In Model (2) we regress only household level characteristics on household supplier status. Model (3) combines community and household characteristics to estimate our choice function $D(.)$ from section 3.3.2. In Model (3) we add four terms interacting stocks of 2000 household wealth with whether a USAID-affiliated NGO operated in the household's municipality. We include these terms because we hypothesize that NGOs use household material wealth as criteria for program participation. Model (4) re-runs Model (3) but with current (2007) suppliers as the dependent variable rather than total suppliers, grouping discontinued suppliers with non-suppliers. In Model (4), therefore, we can examine whether the same set of community and household characteristics has different effects on supplier continued participation than on initial inclusion.

As hypothesized, results in Model (1) and (3) demonstrate that community-level characteristics matter a great deal to supply chain placement: community altitude, access to water year round, distance to the closest market, USAID NGO operations in the community municipality, cell phone reception in 2008, and the distance in 2000 to the closest supermarket retail outlet are significant predictors of household inclusion in the first model. It could be that communities with this intersection of characteristics also tend to have the kinds of capable suppliers that interest supermarkets, so their robustness to the inclusion of household-level wealth and experience variables is noteworthy. When we control in Model (3) for household productive wealth, demographics, and experience, we find that year-round community water access, NGO presence in the municipality, altitude, and community distance to existing supermarket outlets remain four of

the strongest predictors of household inclusion in supermarket supply chains.[10]

At the household level, several characteristics are clearly important. Most critical are the farmer's 2000 irrigation holdings, experience in markets and crop production prior to the supermarket. The farmer's longest running relationship with a non-supermarket buyer of horticulture, tubers, or fruit and years growing a horticulture, tuber, or fruit crop before the supermarket are significant determinants of participation in the supermarket supply chain.

When we join household and community characteristics in Model (3) to predict household participation, what does not seem to matter is nearly as interesting as what does. Model (3) suggests a household-level endowments story, that is, farmer access to the supply chain mediated by pre-supermarket irrigation stocks, though not productive asset stocks apart from irrigation nor the composition of the household nor the education of the household head are significant in Model (3) though participants are overwhelmingly from male-headed households. Consumer durables stocks in 2000 are a negative predictor of participation, but NGO wealth interactions wash out this effect for farmers living in municipalities where USAID-affiliated NGOs operated. Because NGOs are likely to be operating in poorer municipalities, this result captures the differences across municipalities in household wealth; overall, participant farmers are likely to have less material wealth, but within poor municipalities they are likely to be relatively better-off.

Model (4) regresses community and household characteristics to try to identify the set of 232 suppliers who were still supplying the supermarket in

[10]Community characteristics (altitude, depth of water table, year round community water access, NGO presence at the municipal level, distance to paved road, distance to market, years of community cellular phone access, and the distance to the closest supermarket retail outlet in 2000) are jointly significant predictors of individual participation in Model (3).

Table 3.6: Community supply chain placement and household participation probit estimates

	(1)	(2)	(3)	(4)
	Dependent variable: Supplier household			Current supplier (2007)
Explanatory variables	dF/dx	dF/dx	dF/dx	dF/dx
Community altitude (log mts)	0.06***		0.05*	0.06***
Depth of water table (log mts)	0.02		-0.01	-0.03
Distance to paved road (log km)	0.01		0.01	-0.04***
Distance to closest market (log km)	0.10***		0.05	0.03*
Water year round in the community	0.59***		0.50***	0.22***
Cellphone access, 2008 (1=yes)	0.19***		-0.06	0.06**
NGO with USAID affiliation (1=yes)	0.41***		0.59***	0.17**
Distance to supermarket outlet in 2000 (log km)	-0.22***		-0.17**	0.01
Productive wealth				
Productive asset index, 2000		0.05	0.04	-0.04
Consumer durables index, 2000		-0.07	-0.40***	-0.19*
Landholdings, 2000 (mzs)		0.002	-0.004	-0.002
Land Accumulation, 1992-2000 (mzs)		0.002	0.002	0.001
Irrigation, 2000 (mzs)		0.38***	0.36***	0.02
Irrigation^2 2000 (mzs)		-0.06**	-0.09***	-0.003
NGO/ wealth interactions				
Productive asset index, 2000*NGO			0.001	-005
Consumer durables index, 2000*NGO			0.40**	0.13
Landholdings, 2000*NGO			0.001	-0.001
Irrigation, 2000*NGO			0.21	0.003
Demographics				
Age of household head (years)		0.003	0.02	0.02**
Education of household head (levels 1-8)				
Completion of primary school (0/1)		0.20*	0.13	0.09
Completion of secondary school (0/1)		0.30*	0.30	0.27**
Land Worked by Parents (log mzs)		0.02	0.05***	0.03***
Gender of household head (1=female)		-0.28**	-0.20***	-0.12***
Kids in the household (age< 16)		0.02	0.02	0.01
Adults in the household		-0.03**	-0.02	-0.01
Experience (log years)				
Farming experience		0.01	-0.04	-0.01
Longest relationship with non-horticulture buyer		-0.08***	-0.06**	-0.03**
Longest relationship with horticulture buyer		0.22***	0.21***	0.001
Years growing a horticulture/tuber crop (years)		0.05**	0.04	0.05***
N	849	849	849	849
Pseudo R^2	0.354	0.404	0.578	0.386

Note: *, **, *** indicate statistical significance at the ten, five, and one percent levels, respectively.

2007. Notably, the primary determinants of continued participation in the supply chain are community variables. Though completion of secondary school and consumer durables remain important, most of the household wealth variables and NGO/wealth interactions are not significant predictors of participation when we consider the determinants of lasting, continuous participation (through 2008) in the supply chain.

Results in Table 3.6 are noteworthy in two respects. First, we find evidence of the existence of corridors of higher economic potential, areas that, because they are endowed with relative proximity to retail outlets, optimal growing conditions, and year-round access to water are able to participate in new market opportunities. Areas without sufficient water resources or proximity to supermarket backhaul routes are not included in supermarket supply chains. Individuals' opportunities are shown in this case to be conditional on where they live. Our work contributes to the geographic poverty traps literature by establishing circumstances in which geographic externalities affect the returns to private capital, investments by farmers in technologies that increase and stabilize production.

Second, our results suggest that estimates of household welfare effects due to adoption of new markets should be attentive to possible supply chain placement biases in addition to individual selection biases, controlling for community characteristics relating to isolation, water access, and climate. Model (4) most closely approximates a standard supply chain impact evaluation study, which often surveys a cross-section of current suppliers. Our results suggest that, at least in this case, such a study would include significant placement bias were it to exclude community-level water, transport, and isolation variables.[11]

[11]Because most existing supermarket impact estimates studies are matched cross-sections,

Without controlling for both potential sources of bias, it is impossible to distinguish between participation determined by household-level endowments vs geographic placement effects. Here we find that both explanations hold; that is, households with year-round water access and irrigation in 2000 had a significantly higher probability of supermarket channel participation.

Controlling for the potential bias in regional estimates of participation effects requires that we understand the supermarket site criteria determining which communities lie within supermarket supply basins. The problem for impact evaluation arises if program placement depends on the relevant outcome variable or if placement is not controlled for in the estimation. Pitt et al (1993) termed the resulting bias "area heterogeneity bias". For example, appropriate targeting for health clinics might result in their being situated in locations where health outcomes are initially poor, biasing downwards the estimation of effects. Or public health resources might be captured by wealthier groups with better than average starting health outcomes, biasing the results upwards. With the placement of supermarket supply chains the potential bias is less ambiguous: we expect to see inclusion in areas (because of road access, possibilities for year-round cultivation) where participation in markets or welfare is initially higher. Therefore, while results in Table 3.6 are interesting in their own right they are also a necessary first stage in estimating the welfare effects of participation, the task to which we now turn.

this bias generally is not a problem. The problem would result only in the application of such estimates to broader population comparisons.

3.5 Empirical strategy for estimating welfare effects

We study the effects of participation supermarket on 2007 per capita household income. Research has demonstrated clear links between household productive asset holdings and future poverty states (Barrett *et al.*, 2006; Carter and May, 1999; Filmer and Pritchett, 2001; Rosenzweig and Wolpin, 1993). Therefore, we test for effects of participation on holdings and accumulation of several classes of assets: productive assets, consumer durable assets, irrigation, and land.

Two issues underlie our estimation and data collection strategies: possible bias in the welfare estimates due to non-random supply chain placement and bias from non-random household participation in the supermarket contracts. Thorough interviews with current and former supermarket buyers and suppliers suggest that supermarket procurement basins are situated based on observable characteristics related to transport, access, and year-round growing potential. Our data allows us to control for potential bias arising from non-random placement of the supply chains. Regarding the household selection effect, the expected sign of the bias in Nicaragua is unclear. Due to the involvement of NGOs in mediating farmer participation, many farmers have been incorporated into the supply chains with little prior experience in markets or production of crops other than beans and maize. Because building the capacity of these farmers likely takes some time, ordinary least squares estimates of welfare may in fact understate the income or asset effects of participation.

The function describing supermarket effects on farmer income is assumed to be concave in time: a fixed return from the transition to the new technology and positive annual marginal returns that may decrease over time as the farmer

runs into land or labor constraints. Income for supplier farmers can be written as the sum of mean non-supplier farmer income, y^* and the supermarket income function, $f(t|X)$:

$$y_s = y^* + f(t|X) \tag{3.9}$$

For simplicity and empirical tractability, we deal in a linear approximation of the true function of unknown functional form. The short tenure of supermarket presence in-country and of farmer supply relationships in Nicaragua – all surveyed supplier farmers have sold to supermarkets for six or fewer years – suggest this is a reasonable assumption. We assume that the annual effect on income of being a supplier to a supermarket is constant after the first year.

Figure 3.2 plots the income of three farmers, graphing the relationship between supermarket supplier income and mean non-supplier farmer income. The parameter β_1 represents the mean fixed effect on income productive assets, landholdings, and accumulation due to the technology shifts implied by participation. Farmers entering the supermarket supply chain adopt some measure of production and marketing technologies. As described in Section 2, for some farmers the transition implies a shift of production into horticulture from basic grains; for farmers already producing some horticulture for sale, the supply relationship may imply the cultivation of a new variety, the addition of a new crop to an existing portfolio, or the adoption of irrigation to meet specific transaction scale or timing requirements. There is expected to be heterogeneity in the technologies' effect on incomes or assets depending on farmers' initial production and marketing technologies.

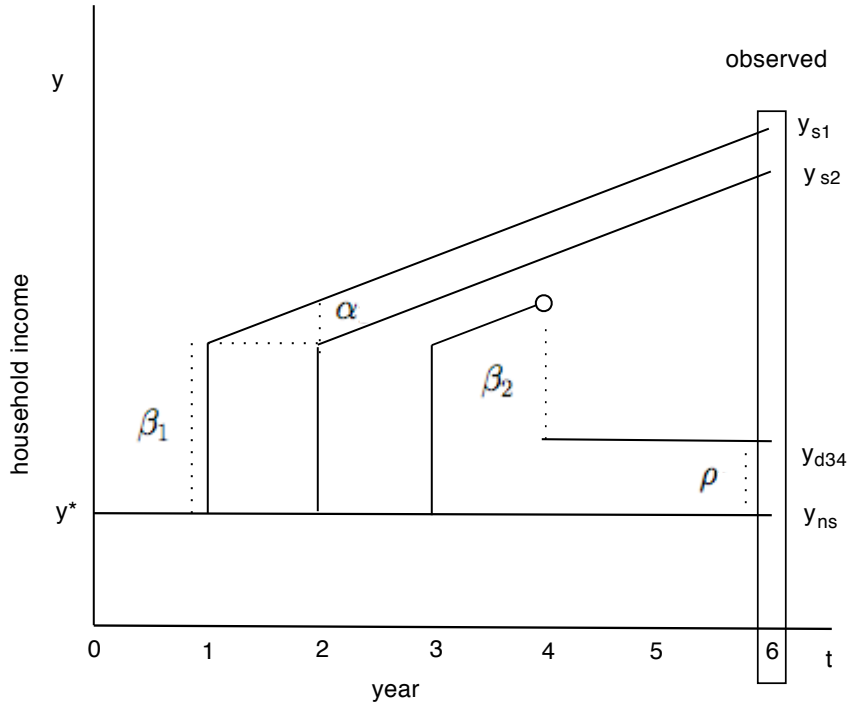

Figure 3.2: Graph of the hypothesized relationship between supplier income (y_s) and non-supermarket channel farmer income (y^*) for an example non-supplier, two current suppliers, and one discontinued supplier.

Figure 3.2 assumes that all farmers begin at mean income, $E(y|X) = y^*$ in year $t = 0$ and that non-supplier mean income exhibits no annual growth trend. In year one, farmer $s1$ joins the supermarket supply chain. In year two farmer $s2$ joins the supply chain. Farmer ns continues his production and market technologies as in period $t = 0$.

Participation in supermarket supply chains is generally modeled as a binary condition; models assume that producers either sell into a supermarket procurement channel or they do not. Yet there is significant variation in the degree to which a farmer participates: how many years the farmer sells to the supermarket, the percentage of his crop he sells to a supermarket, how concentrated his

overall production is planted in crops he sells to the supermarket, the fraction of his sales transactions that are conducted with the supermarket, etc. Variation in the degree of participation suggests researchers may be throwing out important information by reducing the channel choice to a dichotomous variable.

Rather than treat participation in the supermarket supply chain as a one-time shock with the potential to shift household welfare, we can use information about the tenure of suppliers' supply relationships with supermarkets to test the hypothesis that there exists an annual incremental welfare effect to being a supermarket supplier or whether the relationship represents a single, level-effect to household income and asset stocks. In the macroeconomic growth literature, some debate has centered around the dynamic effects of national saving, international trade, or education on a nations' rate of output or welfare (Solow, 1956; Young, 1991). We pose a similar question with respect to the effect of supermarket participation on welfare: what is the effect of a multi-year supply relationship with the supermarket on participant outcomes? Adopting the vocabulary from the growth literature, changes in variables that affect the steady state level of output are said to have a level effect while those that affect the long run growth rate of output are said to have a growth effect. Do positive effects accrue to farmers with longer tenure supply relationships? Is there evidence of a growth effect? The parameter α in Figure 3.2 captures this growth effect of the relationship, the mean annual returns attributable to improved relationships with the company over time due to larger orders, better pricing, increased numbers of products supplied, etc.

Our household survey observes the income and assets of all farmers in period $t = 6$. From these observations and knowledge of the start dates and tenure

of farmers' supermarket supply relationships β_1 and α can be estimated.

Discontinued suppliers

Figure 3.2 adds an additional dimension to the estimation: not all suppliers stay suppliers. In the set of 396 suppliers, 153 (39 percent) had exited the supply chain by 2007. Evidence from cases studying the structure and operations of food industry procurement networks suggests some turnover in participant producers, but generally this population shows up only peripherally in studies of participation. For example, a comparative study of supply chains for supermarkets in Bangkok and Nanjing by Ruben *et al* 2007 reports that the retailer TOPS in Thailand began with 250 producers in 1998 but scaled back to 60 growers by 2002. A case study of the Brazillian supermarket sector finds that 61,000 small dairy farmers were delisted between 1996 and 2000 (Farina, 2002).

In Nicaragua, our evidence demonstrates that suppliers who leave the supply chain tend to stay in the production of horticulture after leaving the chain; only 13 out of 153 disadopting farmers no longer farmed horticulture by 2008 and the majority of disadopting suppliers still listed a supermarket-sourced crop as the most remunerative crop in their (post-supermarket) 2007 production portfolio. Important questions for theory and policy therefore involve how and when producers make the decision to leave markets, not just who joins a particular marketing channel. Here, we study the incomes and assets of disadopters to estimate whether there are lasting effects to having been in a supply chain that persist after exit. This might be the case if, for example, participation in supermarket supply agreements are associated with increased investment in irrigation or household productive asset stocks.

Figure 3.2 includes the income path of a farmer who entered the supply chain in year three and left the supermarket supply chain in year four, $d34$. The income path of farmer $d34$ is stylized to facilitate interpretation in Figure 3.2. As before, β_1 represents the fixed effect of supplying a supermarket and α the annual effect. The parameter β_2 captures the income increment in $t = 6$ for discontinued supplier farmers compared with non-suppliers, while ρ captures the fixed cost (or benefit) of exit – the mean fixed income difference between discontinued suppliers and those who remain with the supermarket. An intuitive interpretation of parameter ρ is that it is the immediate decrease (increase) in income that results from leaving the supply chain. Figure 3.2 shows a negative ρ, implying there are costs to exit, but this need not be the case.

The analysis in the previous section demonstrated that supply chains are situated based on a set of community level observable characteristics including water access and relative isolation. The core equation to be estimated is:

$$Y = \delta + \beta_1 S + \alpha T + \beta_2 D + \gamma_1 Z + \gamma_2 X + \epsilon \tag{3.10}$$

Where S is a dummy equal to one if the individual supplied a supermarket in 2007, T represents the number of years that the farmer sold to the supermarket, D is farmers who have exited form the channel. For controls, X represents a vector of observable household wealth and demographic characteristics and Z represents the vector of community characteristics demonstrated in the previous section to be significant determinants of supply chain placement. Epsilon is the normally distributed error term. Predicted signs of the coefficients are: $\beta_1 > 0$, $\alpha > 0$, $\beta_2 > 0$. We can use β_1, α, and β_2 to derive an estimate of ρ, using $\beta_1 + \alpha T + \rho = \beta_2$.

Ideally, we would observe supermarkets randomly selecting a set of farmers as suppliers and then buying from them over randomly-determined intervals. We would then compare income Y_{1t+1} for farmers randomly selected into the supply chain and Y_{0t+1} for farmers randomly excluded from the marketing opportunity.

Conditional on supply chain placement and household observables, the central empirical challenge is accounting for bias from household unobservables determining selection into and out of the supply chain. The case for farmer-level selection and exit on unobservables is plausible in a context in which both supermarkets and small farmers act strategically to determine participation in the supply chain. If supermarkets contract with farmers characterized by some unobserved, uncontrolled for characteristic that is correlated with income or wealth, estimates of the effect of the supermarket will be biased. The effect attributable to supermarkets will be overstated because it will conflate supermarket effects with effects on incomes due to unobserved ability or initiative. Another possibility is that the NGOs or buyers involve farmers with systematically less managerial experience or ability due to, for example, program criteria to reach the poor (in the case of NGOs) or because more risk-averse farmer are less likely to engage in contractual hold-up (in the case of buyers). In this case, OLS estimates would underestimate the effect of the supermarket supply contract.

For our coefficient estimates to be efficient and unbiased $Cov(S, \epsilon) = 0$, $Cov(D, \epsilon) = 0$ and $Cov(T, \epsilon) = 0$ must hold. If, however, supermarket suppliers are specially characterized by ability or initiative and if these variables are omitted from the estimation, supplier status and tenure are endogenous. In this

case, our equation should be written:

$$Y = \delta + \beta_1 S + \alpha T + \beta_2 D + \gamma X + (\epsilon + u) \tag{3.11}$$

where u represents the part of the error term that contains unobserved correlates of supplier selection and placement and $Cov(S, u) \neq 0$ and/or $Cov(D, u) \neq 0$, $Cov(T, u) \neq 0$. What this means is that β_1, α, and β_2 will describe both the effect of supplying a supermarket and being high ability/high initiative. Estimates of the effects of supermarket supply chain participation on farmer welfare must credibly deal with this problem of supply chain placement and individual selection bias. Our data offer a rich set of explanatory controls relating to farmer experience, wealth, supply chain placement, and agricultural potential. Because supply chain placement characteristics at the community level are observable and (over this time period) invariant we can control for them. We find no evidence that suppliers relocate strategically to communities in supply basins in order to gain entry as suppliers, eliminating one possible confounding mechanism.

We begin by estimating under the optimistic assumption that our rich set of explanatory variables adequately control for all relevant observables and that no unobservables jointly determine participation and welfare outcomes. We can control for experience in production and markets, a host of productive assets prior to supermarket entry, household labor supply variables and relevant demographics.

The first column of Table 3.7 includes the OLS estimates regressing supplier status on wealth, experience, demographic, and regional controls. In the second column of Table 3.7, we control for the supply chain placement effect by adding the set of community controls from the previous section. In both estimations, the

mean effect of being a supplier on household per capita income is positive and economically and statistically significant, an increment equal to nearly double the mean per capita household 2007 income in the non-supplier sample, $480.80. Notice that the estimate of per capita income effects decreases slightly when the community access and agroclimactic controls are added.

Table 3.7: Results from OLS and instrumental variables (IV) regressions, effect of being a current or discontinued supplier and tenure of relationship on 2007 household per capita income.

Dependent variable: Per capita income (USD 2007)			
	OLS	OLS	IV
Explanatory variables	(1)	(2)	(3)
β_1 Supermarket supplier (0/1), level effect	853.96***	817.88**	791.65
	(326.71)	(324.32)	(637.57)
α_1 Relationship tenure (years), growth effect	39.26	36.74	130.67**
	(62.65)	(64.20)	(60.44)
β_2 Discontinued supplier (0/1)	425.24*	395.88*	774.79
	(258.14)	(234.00)	(621.41)
Productive assets, 2000	439.93**	451.56**	400.05
	(236.37)	(224.26)	(243.75)
NGO*Productive assets, 2000	792.23***	799.26***	825.81**
	(284.83)	(274.19)	(367.01)
Community Characteristics	n	y	y
n	849	849	849
R^2	0.367	0.372	

Note: Standard errors are in parentheses. Errors are clustered at the community level and IV standard errors (3) are bootstrapped. Household demographic, community, regional, and crop controls are included regressors in all models.

However, even controlling for a rich set of household and community variables, household participation, tenure in the supply chain, and exit from the contract relationship are likely endogenous to income and other welfare outcomes including asset and land accumulation. The objective of this paper is to obtain estimates of the effect of participation in supermarket supply chains

on participant farmer incomes and assets that are unbiased by the presence of individual selection into the channel. To achieve that goal requires a set of instrumental variables correlated with participation, supply chain tenure, or exit but otherwise unrelated to welfare outcomes.

To correct for possible individual selection bias into the supply chain, in tenure of the duration of the supply relationship, and exit from the chain, we use instrumental variables to estimate the effects of participation in supermarket supply channels on the set of 2007 income and asset welfare indicators. We employ a combination of the following instrumental variables to instrument in three separate first stage equations for current supplier status, tenure, and supply chain exit in our welfare effects estimations:

- Longest relationship with non-supermarket buyer of horticulture, tubers, or fruit
- Years growing a supermarket sourced crop including horticulture, tubers, or fruit, before the supermarket
- Area of landholdings worked by the household head's parents
- Distance, as the crow flies, to closest retail outlet in 2000
- Year of entry into the supply chain, as an instrument for tenure in the supply relationship for supplier farmers only

Table 3.8 presents the results from the three first stage equations instrumenting for 2007 supplier status and relationship tenrure and demonstrates that instruments are correlated with the endogenous regressors. In the first stage equation estimation (1a) we use a probit model to predict current supplier status. The

first stage equation (1b) uses a count data model to predict tenure of the supply relationship. We use a log-linear model and assume a Poisson error structure. Tenure is instrumented conditional on having been a supplier, for this reason n is equal to the set of 396 suppliers. The first stage estimation of exit from the supply chain (1c) uses a probit model. Table 3.8 demonstrates clear correlation of the instruments with the endogenous regressors. We test the suitability of the instruments with a first stage F-statistic, testing the null hypothesis that the coefficients on the instruments are jointly equal to zero. Table 3.8 presents the results for these tests for each first stage regression. Small values, generally smaller than ten, of the first stage F-statistic imply failure of the assumption that the instruments are correlated with the treatment. For each first stage regression, the test statistic exceeds ten.[12] Tables 3.9 and 3.10 present results from the regression of instrumental variables on per capita income and household changes in irrigation, and productive assets. Results in tables 3.9 and 3.10 provide strong evidence that the instruments are orthogonal to the errors in the welfare equations.

3.6 Empirical results

Tables 3.7, 3.6, and 3.6 present results from regressions estimating the effect of participation on per capita income, productive asset accumulation between 2000 and 2007 and changes in irrigation between 2002 and 2008. We find that participation in a supermarket supply chain has a positive and statistically significant

[12]The validity of instruments related to prior market and production experience stems from the considerable heterogeneity in our data disrupting potential correlation between each instrument and welfare outcomes. Two dimensions are of special relevance: heterogeneity in farmer supermarket supply chain entry pathways and heterogeneity in farmer production profiles (technologies and crops).

Table 3.8: Results from first stage instrumenting regressions.

	Instrumented explanatory variable (1a) Current supplier	(1b) Tenure supplying	(1c) Discontinued supplier
Longest relationship with		.	.
horticulture/tuber/fruit buyer (log years)	.	.	0.35***
Years growing a horticulture/tuber crop	0.23***	.	.
Land worked by household head parents (log mzs)	0.10**	.	.
Year of chain entry	.	-0.29***	
Community variables:		.	.
Distance to closest retail outlet, 2000 (as the crow flies)	.	.	-0.37***
Altitude	0.22***	.	-0.19**
HH demographics	y	y	y
Community Characteristics	y	y	y
Region controls	y	y	y
Crop controls	y	y	y
NGO interactions	y	y	y
First stage F-statistic	12.14	585.65	22.46
p-value	0.000	0.000	0.000
n	849	396[a]	849

[a]Tenure is instrumented conditional on having been a supplier, for this reason n is equal to the set of 396 suppliers.

Table 3.9: OLS regressions of instruments on the changes in the asset index, 2007-2000, and 2007 income with full second stage regression controls.

Instrument	per capita 2007 income full sample n=849	per capita 2007 income suppliers only n=396	Δ Productive asset index, 2007-2000 full sample n=849	Δ Productive asset index, 2007-2000 suppliers only n=396
Longest relationship with horticulture/tuber/fruit buyer (years)	3.81	.	0.005	.
	(12.10)	.	(0.003)	.
Years growing a horticulture/tuber crop	88.28	.	0.02	.
	(63.26)	.	(0.03)	.
Land worked by household head parents (log mzs)	54.31	.	0.01	.
	(56.72)	.	(0.02)	.
Distance to closest retail outlet, 2000 (as the crow flies)	101.04	.	0.05	.
	(129.17)	.	(0.05)	.
Altitude	34.16	.	-0.03	.
	(70.72)	.	(0.03).	
Year of chain entry	.	-39.62	.	0.002
	.	(68.26)	.	(0.02)
HH demographics	y	y	y	y
Community characteristics	y	y	y	y
Crop controls	y	y	y	y
Region controls	y	y	y	y
NGO Interactions			y	y
Adjusted R^2				

Note: Standard errors included in parentheses.

Table 3.10: OLS regression of instruments on change in household irrigation, 2002-2008, with full second stage regression controls.

	Irrigation 2008-2002 full sample n=849	Irrigation 2008-2002 suppliers only n=396
Longest relationship with horticulture/tuber/fruit buyer (years)	0.004	.
	(0.003)	.
Years growing a horticulture/tuber crop	0.01	.
	(0.01)	.
Land worked by household head parents (log mzs)	-0.002	.
	(0.01)	.
Distance to closest retail outlet, 2000 (as the crow flies)	0.0002	.
	(0.0002)	.
Year of chain entry	.	-0.04
	.	(0.03)
HH demographics	y	y
Community characteristics	y	y
Crop controls	y	y
Region controls	y	y
NGO Interactions	y	y

Note: Standard errors included in parentheses.

growth effect on participant income and productive assets, evidence that increases in the income effect of being in the supermarket supply chain accrue to those who remain in the relationship for longer periods. The magnitudes of these estimates are relatively large. Given that the mean supply relationship is 2.5 years duration, the estimated growth effect represents a total 2007 mean income increase of $325 USD. As stated previously, the mean per capita income for non suppliers in 2007 was $480.80. This income effect estimate is similar in magnitude to what has been estimated elsewhere. For example, Maertens and Swinnen's (2009) study of export horticulture in Senegal estimates extremely high income effects for suppliers: 50 to 130 times higher than average non-participant income. The fact that the instrumental variables estimate of the growth effect, α, is larger than the OLS estimate, is possible evidence of poor instruments. However, it is unclear, particularly due to the involvement of NGOs

(sometimes favoring asset poor farmers) influencing participation, whether the direction of the bias due to endogeneity is positive or negative. Moreover, given that our first stage regressions for tenure in the supply relationship have high F-statistics and good predictive power, this may be evidence of negative bias in the OLS income estimates.

Results in Table 3.6 indicate that there is a significant level effect of being a supplier on irrigation[13] accumulation, a mean of approximately an additional third of a manzana put into irrigation for current (2008) suppliers between 2002 and 2008. Relative to the base mean for suppliers of 0.26 manzanas irrigated in the year 2000, an additional 0.3 manzanas nearly doubles mean household irrigation holdings. Discontinued suppliers have a significantly lower investment in irrigation over this period. The mean total change in irrigation for non-suppliers over this period is +0.03 manzanas. A level effect on irrigation for current suppliers but not exited suppliers suggests the existence of a minimum threshold investment required for continued participation in the supply chain.

Does a farmer's production state prior to the supply relationship affect returns to participation in the supermarket marketing channel? In all regressions, we include terms interacting an indicator for whether the farmer grew only basic grains (maize, sorghum, beans, or rice) before entering the supply chain (in 2001 for non-suppliers) with all three participation variables (current supplier, tenure of supply relationship, and discontinued supplier). We do not find that farmers who grew only basic grains before supplying the supermarket experienced significantly lower level or growth effects on irrigation, incomes, or pro-

[13]Model (5) of Table 3.6 re-runs Model (4) but excluding the top one percent of the irrigation change distribution to test the sensitivity of the results to a small group of high-investment outliers. The distribution is not symmetrically trimmed because there are no farmers in the regression set that decreased their irrigation holdings over the observation period. In the discussion, we refer to results in Model (5).

ductive asset accumulation.

To study if participant welfare effects vary according to whether the farmer entered the supply relationship through an NGO program, we include terms interacting whether the farmer was assisted by an NGO with the participation variables. NGO assistance in the supply chain has no significant level or growth effect on income, but we do find that farmers assisted by NGOs had significantly higher level accumulation of productive assets between 2000 and 2007 but a decreased growth rate in productive assets, suggesting a bulk asset transfer or facilitated acquisition through the NGO. We find the same pattern for irrigation investment with the NGO: a high level effect and a negative growth effect.

We find no significant effects on land accumulation between 2000 and 2008, consumer durables accumulation between 2000 and 2008, or livestock holdings in 2008 for current suppliers, tenure of supply relationship, or discontinued suppliers. The second appendix contains tables of results for these instrumental variables and OLS regressions.

3.7 Discussion: Mechanisms

We have found a significant positive growth effect on income and productive assets for farmers participating in supermarket supply chains and that estimated effects persist after farmers exit the chain. We also find level increases in investments in irrigation for current suppliers and level increases in productive assets for farmers assisted by NGOs. In this section, we consider three possible related mechanisms driving income growth increases: the relationship increases agricultural productivity; the supply relationship helps the farmer access credit and

Table 3.11: Results from OLS and instrumental variables (IV) regressions, effect of being a current or discontinued supplier and tenure of relationship on asset accumulation, 2007-2000

	Productive asset change 2007-2000 index	
	(1)	(2)
Explanatory variables	OLS	IV
β_1 Supermarket supplier (0/1), level effect	0.25	0.11
	(0.16)	(0.21)
α Relationship tenure (years), growth effect	-0.007	0.04**
	(0.02)	(0.02)
β_2 Discontinued supplier (0/1)	0.10	0.01
	(0.12)	(0.22)
Supermarket supplier*Basic grains before supplier	-0.13	-0.002
	(0.25)	(0.23)
Relationship tenure*Basic grains before supplier	0.04	0.01
	(0.06)	(0.04)
Discontinued supplier*Basic grains before supplier	0.10	0.01
	(0.20)	(0.28)
Supermarket supplier*NGO assisted	0.16	0.41**
	(0.21)	(0.20)
Relationship tenure*NGO assisted	-0.07	-0.09**
	(0.05)	(0.04)
Discontinued supplier*NGO assisted	-0.12	0.01
	(0.21)	(0.35)
Productive assets, 2000	0.02	-0.001
	(0.05)	(0.06)
Consumer durables, 2000	0.15**	0.15**
	(0.07)	(0.07)
n	849	849
pseudo R^2	0.277	

Note: Standard errors are in parentheses and clustered at the community level. IV standard errors in (2) are bootstrapped. Household demographic, community, regional, and crop controls are included regressors in all models.

Table 3.12: Results from OLS and instrumental variables (IV) regressions, effect of being a current or discontinued supplier and tenure of relationship on irrigation change, 2008-2002

	Irrigation change 2008-2002 mzs		
	(3)	(4)	(5)
Explanatory variables	OLS	IV	IV
β_1 Supermarket supplier (0/1), level effect	0.32***	0.44***	0.35***
	(0.10)	(0.18)	(0.12)
α Relationship tenure (years), growth effect	-0.02	0.03	0.03
	(0.02)	(0.03)	(0.02)
β_2 Discontinued supplier (0/1)	0.25	-0.49*	-0.37
	(0.13)	(0.25)	(0.28)
Supermarket supplier*Basic grains before supplier	-0.003	-0.60*	-0.28
	(0.14)	(0.32)	(0.34)
Relationship tenure*Basic grains before supplier	-0.02	0.12	-0.002
	(0.03)	(0.09)	(0.03)
Discontinued supplier*Basic grains before supplier	0.14	0.13	0.30
	(0.22)	(0.31)	(0.24)
Supermarket supplier*NGO assisted	0.80***	1.33***	0.78***
	(0.22)	(0.45)	(0.28)
Relationship tenure*NGO assisted	-0.11**	-0.15**	-0.07*
	(0.05)	(0.06)	(0.04)
Discontinued supplier*NGO assisted	-0.50**	0.02	0.25
	(0.20)	(0.41)	(0.34)
Productive assets, 2000	0.02	-0.01	0.03
	(0.02)	(0.03)	(0.05)
Consumer durables, 2000	0.04	0.06	0.05
	(0.04)	(0.05)	(0.05)
HH demographics	y	y	y
Community Characteristics	y	y	y
Region controls	y	y	y
Crop controls	y	y	y
Top 1% of the distribution	y	y	n
n	849	849	841
pseudo R^2	0.228		

Note: Standard errors are in parentheses and clustered at the community level. IV standard errors (4) and (5) are bootstrapped. Model (5) drops the top one percent of the distribution of changes in irrigation to verify that the results in Model (4) are not being driven by a small handful of high-accumulation outliers.

thus loosens a household's liquidity constraint; or the relationship spurs farmer investment in production.

The challenge is that evidence supporting any one or several of these mechanisms is likely to be plagued by the same issues of endogeneity and placement and selection bias. For example, one might consider the significantly higher bean and maize per hectare yields of supplier farmers evidence of increased productivity spillovers in the supply chain. However, innately higher productivity of the farmers is likely correlated with entry into the channel in the first place. In this section we begin to explore candidate mechanisms, largely with qualitative evidence and descriptive statistics. The analysis in this section therefore is merely suggestive exploration to motivate future research on the precise mechanisms through which supermarket channel participation increases supplier incomes.

First, to demonstrate increases in productivity, one ideally would observe farmers' production and production systems before and after the supply chain entry. Without such data, our instrumented regressions on 2008 irrigation holdings and irrigation investment provide strong evidence that farmers invest in the sorts of technologies that increase agricultural productivity (Table 3.6 and Table 3.6).

Tables 3.7 and 3.7 disaggregate suppliers and non-suppliers by their pre-supermarket landholdings and irrigation status. The top section of Table 3.7 presents data on whether supplier farmers had irrigation before they became suppliers and the bottom half describes their irrigation status in 2008. In a previous paper we characterized a dualism in Nicaraguan horticulture production and marketing (Michelson *et al.* 2010) defined by irrigation holdings and we

found that the suppliers concentrated in cooperatives supplying supermarkets were without irrigation before supplying the supermarkets and predominately irrigated after, suggesting a technological transition strongly correlated with participation in a supermarket supply chain. The top half of Table 3.7 is therefore a characterization of the agricultural production sectors from which supermarkets in Nicaragua draw suppliers. Only 23.9 percent of contracted suppliers had irrigation when they began supplying the supermarket.

Table 3.13: Supplier landholdings and irrigation prior to supermarket supply contract and in 2008

	Landholdings before becoming supplier			
	≤ 3.5 ha	(3.5, 7 ha]	>7 ha	Total
Irrigation before supplying (y/n)	60	10	25	95
No irrigation before supplying (y/n)	193	52	56	301
Irrigation in 2008	111	22	43	176
No irrigation in 2008	144	40	36	220
Total	255	62	79	396

Table 3.14: Non-supplier landholdings and irrigation in 2000 and in 2008

	Non-supplier landholdings in 2000			
	≤ 3.5 ha	(3.5, 7 ha]	>7 ha	Total
Irrigation in 2000	1	4	2	7
No irrigation in 2000	242	59	158	459
Irrigation in 2008	2	4	10	16
No irrigation in 2008	238	60	152	450
Total	240	64	162	466

Table 3.7 presents the same information for non-suppliers' irrigation status in 2000 and 2008, by landholding class. We see evidence in these tables that suppliers, particularly small farmer suppliers, are significantly outpacing non-suppliers in investments in irrigation. Given that the mean age of suppliers is significantly lower than non-suppliers, this might reflect a life-cycle effect, that is, supplier farmers are younger and younger farmers are more likely to

adopt new technologies. However, non-suppliers are less invested in irrigation initially and the gap between suppliers and non-suppliers only widens between 2000 and 2008.

A liquidity constraint is defined as the inability of a household to borrow. If the start-up costs to participation in a supermarket supply chain are non-trivial, a borrowing constraint can effectively exclude low-wealth households. Second, regarding whether the supply relationship affects farmer liquidity, permitting increased investment in horticulture, we find that participation in a supermarket supply is positively associated with 2007 credit received. Table 3.7 contains descriptive statistics for the mean total credit borrowed by the household in 2007 and the mean number of credit sources. Respondents were read a list of credit sources and asked whether, in the previous twelve months, any member of the household had received credit from that source. The list of sources included: private bank, credit or savings cooperative, producers' cooperative or association, unconventional bank, rural bank or agricultural lender, NGO or project, government program, commercial trader, buyer, moneylender, other area farmer, family or friend, or other. A much higher share of suppliers used credit in 2007 than did discontinued suppliers or non-suppliers. Moreover, suppliers had higher mean total credit, though not statistically significantly so, and a slightly larger number of credit sources, on average, than non-suppliers.

We find a significant effect of the length of the supply relationship on 2007 credit when we instrument for current supplier status, supply chain exit, and tenure. Table 3.16 presents the instrumental variables regression results. This finding makes sense, given that some small farmer suppliers access credit through NGOs facilitating the supply contracts; many small farmers operating

Table 3.15: Descriptive statistics on credit, by 2007 supplier status

	Current suppliers	Discontinued suppliers	Non-suppliers
Reported credit in 2007 (n)	171	67	119
Percent of group	73.7%	43.7%	24.8%
Credit borrowed			
(USD 2007)	1544.98	1242.88	1013.82
	(1376.16)	(1446.05)	(1462.42)
Credit sources, total	1.08	1.09	1.01
	(0.32)	(0.29)	(0.09)

Note: Standard deviations in parentheses

independently of NGOs report that the supply agreement suffices to secure an agricultural loan in regional banks and that credit worthiness likely builds over time with the bank.

Table 3.16: Results of instrumental variables (IV) regression, effect of 2007 supplier status and tenure on 2007 credit.

	Credit (2007 USD)
	2007
Explanatory variables	2SLS
β_1 Supermarket supplier (0/1)	567.33
	(537.77)
α Relationship tenure (years)	146.6*
	(82.92)
β_2 Discontinued supplier (0/1)	-331.39
	(421.58)
Wealth controls	y
HH demographics	y
Community Characteristics	y
Region controls	y
Crop controls	y
n	849
pseudo R^2	0.157

Note: Errors are clustered at the community level and IV standard errors are bootstrapped. Instruments are as in Section 3.6.

Finally, previous work established (Michelson *et al.* 2010) that though the mean output prices paid by supermarkets in Nicaragua are not significantly

higher than the traditional market, output prices paid by supermarkets exhibit significantly less volatility than the traditional market. In some cases, the supermarkets verbally or contractually guarantee the farmers a minimum output price. Qualitative interviews with farmers confirmed that this guaranteed minimum output price is a primary attractive feature of supply relationships. The importance of the provision of the minimum price is some measure of insurance against output price volatility.

A consistent finding of empirical work estimating effects of residual risk attributable to imperfections in savings, credit, and insurance markets is that residiual uninsured risk can lead to inefficient under investment in technology adoption and have costly effects on the household in the form of foregone output (Sandmo, 1971).

A final hypothesis is that effects on participant incomes comes through increasing production quantities at a more stable output price guaranteed by the supermarket in concert with increased liquidity facilitated that the farmer can access with the contract (through NGOs or regional banks willing to accept the supply agreement as a guarantee of stable income source).

The story of increased incomes through increased output quantities in the presence of decreased output price risk complements nicely conclusions from existing studies that have suggested that longer or more frequent production cycles are associated with supermarket participation. Balsevich *et al.* (2005) find that growers accessing supermarkets plant an average of 0.6 more cycles in a year than traditional growers. Neven and Odera (2009) find that supermarket orders for suppliers with long-term supply agreements come in throughout the year. Our contribution is to link findings on increased incomes explicitly to the

reduction of downside output market risk.

3.8 Conclusions

The rapidly increasing presence of supermarkets in developing countries is a well-established recent phenomenon with implications for international development and poverty outcomes. As a supermarket chain's domestic market share grows, the company turns to regional producers to satisfy a steady demand for fresh produce. This expansion of supermarket procurement channels may mean exclusion or opportunity for small farmers. Supermarket buyers generally demand that suppliers satisfy chain-specific transaction requirements; in exchange they offer incentives that might include guaranteed purchase volumes or prices.

This research addresses a set of questions relevant for smallholders, policymakers, and development economists: what are the welfare effects on small farmers of these new market opportunities? Could participation in new supermarket-directed market channels offer a viable high-value agriculture opportunity for smallholders?

This research has made three primary contributions to the empirical literature on the effects of the expansion of supermarkets in the developing world on small farmers. We show that geographic and natural resource endowments are significant predictors of community inclusion in a supermarket procurement basin. Conditioning on this supply chain placement, instrumental variables analysis is used to control for the farmer selection effect and also to estimate the effect on a set of welfare variables (including household per capita incomes,

irrigation, and productive assets) from supplier arrangements with supermarkets. Our approach is the first to instrument for three dimensions of participation in supermarket supply chains: current supplier status, tenure of farmer participation in the supply chain, and discontinued supply relationships. We use a combination of instruments in our three first stage equations: the length of the farmer's longest relationship with buyers purchasing horticulture crops, the length of time a farmer has grown a crop that is a non-basic grain nor a cash crop, the distance from the closest retail outlet in the year 2000, and the amount of land worked by the farmers' parents.

We find positive statistically and economically significant effects on participant farmer incomes, productive assets, and irrigation. We find evidence of a growth effect, larger effects on incomes and productive assets accruing to farmers with longer tenure supply relationships. Our evidence suggests that these income and productive asset increases are retained by farmers who exit the supply chain. In addition, we find a significant positive level effect on irrigation investment for suppliers and a corresponding negative effect on the irrigation investment of exited farmers. Farmers who joined the supply chain through NGOs invest significantly higher levels of irrigation and productive assets.

Finally, household survey data is used to investigate three candidate mechanisms that might drive these positive effects: the supermarket supply agreement loosens the liquidity constraint; the supermarket supply agreement increases agricultural productivity; or the relationship spurs farmer investment. We find evidence that the supply contract is associated with increased farmer access to credit. This credit, combined with price insurance of the contract, permits increased farmer investment in horticulture.

CHAPTER 4

ESTIMATING THE EFFECTS OF NEIGHBORS' PARTICIPATION AND EXIT BEHAVIOR ON FARMER MARKET PARTICIPATION

4.1 Motivation

Theoretical and empirical research into the mechanisms of household technology adoption has been increasingly focused on analyzing the role of social learning and mimicry. Considerable evidence now supports the hypothesis that social processes influence farmers' experimentation with new agricultural methods and inputs (Conley and Udry, 2010; Foster and Rosenzweig, 1995; Maertens, 2009; Moser and Barrett, 2006; Munshi, 2004). The existence of social adoption pathways for technology adoption has implications both for models of innovation diffusion and for policies to promote the uptake of welfare-improving technologies in the developing world.

Building on the insights of the technology adoption literature linking adoption to social processes, this paper tests for the existence of social dynamics in farmers' decisions to participate in new agricultural output markets. Market participation is a critical determinant of household poverty outcomes as well as a natural methodological and theoretical extension of existing research on the technology adoption process.

However, the social dynamics governing the adoption of a marketing contract are likely to differ in important ways from those influencing the adoption of a new high yielding variety of maize or cotton. In particular, the pecuniary externalities on existing suppliers of a new entrant into a modern value chain

may be both more significant and more immediate than the effects of a farmer's adoption of a high yielding crop variety in a context of well-integrated output markets. In the case of supermarkets, anecdotal evidence suggests that the likelihood of contractual hold-up by the supermarket rises as the number of community suppliers increases.

A second dimension distinguishing participation in high value markets is the relatively high observed levels of farmer exit from modern marketing channels (Jano and Mainville, 2006; Ruben *et al.*, 2007). While some technology adoption research has considered the phenomenon of disadoption (Moser and Barrett, 2006; Neill and Lee, 2001; Reardon and Farina, 2000), these processes have thus far been only minimally estimated and modeled. In the context of modern markets, it remains to be explored what information a farmer's exit might hold for neighboring farmers.

This research uses a lifecycle model to explain supermarket supply chain participation and exit patterns in Nicaraguan supermarket supply communities. We hypothesize that farmers learn about the profitability of a new marketing channel relative to the traditional market from their own experience, but also from their neighbors' experience, in two ways. Farmers learn both from neighbors' accumulating experience and from neighbors' exit. Our research therefore incorporates own experience, own exit, neighbors' experience, and neighbors' exit from supermarket supply chains into a conditional logit model to test whether farmers' observation of these variables influence the decision to participate in subsequent periods and to estimate whether some farmers pay a price for experimentation with the new market opportunity. Our method of including neighbor exit and tenure as possible determinants of farmer market

participation has potential application to a variety of technology and market adoption cases.

Results from a fixed effects conditional logit model estimating the likelihood of participation in supermarket supply chains among Nicaraguan farmers suggest that neighbors' exits from the supermarket supply are significant negative influences on a farmer's own decision to participate in the new market while observation of neighbors' accumulating experience in the supply chain is a significant positive determinant of farmer's participation. However, observing a neighbor's exit is a significantly more powerful signal than observing another year of neighbor experience and this signal is significantly more powerful still for farmers who are in the channel themselves rather than those that have not yet entered the supply chain. Evidence of strategic delay on the part of farmers suggests that we observe a social process rather than a firm-level roll out of new contracts within a given village.

4.2 Literature review

Research into the role of social learning and diffusion in technology adoption in the developing world is rooted in analysis of the adoption of high yielding varieties (HYV) and associated productivity-increasing technologies. Accumulating evidence suggests that social influences indeed play a critical role in the uptake and spread of new technologies, whether through direct learning from neighbors or mediated through social pressures. Early work by Narayan and Pritchett (1999) in Tanzania established a strong positive relationship between households' social capital and use of modern agricultural inputs such as agro-

chemicals, fertilizer, and improved seeds. Subsequently, Isham (2002) found that social affiliations in Tanzania influence farmers' adoption of fertilizer and Munshi (2004) identified that wheat growers' HYV adoption during the Indian Green Revolution incorporated the experience of neighbors. Foster and Rosenzweig developed an influential target-input model of HYV adoption (1995) and their results further established the influence of learning from others and free-riding on neighbors' adoption in HYV rice and wheat in India. The research into social networks and technology adoption has grown further nuanced. Maertens (2009) distinguishes between social mechanisms, untangling the effects of social pressures versus social learning in the adoption of Bt cotton in villages in central India.

Significantly less attention has been paid to social processes influencing participation in emerging modern output markets. How do farmers come to participate in new output markets and what role might social networks and social connectivity play in determining that participation? In some research the role of a market is implicit, inextricable from the technology being adopted. For example, Conley and Udry's (2010) study of adoption of pineapple for export in Ghana is simultaneously a study of market participation and technology adoption. The authors find strong evidence that farmers learn about optimal input allocation from their successful neighbors, but the marketing decision itself is secondary and left largely in the analytical background.

A second gap in the literature concerns the need to incorporate disadoption of technologies and markets into estimates and models of adoption and learning. Moser and Barrett's (2006) study of the dynamics of smallholder adoption of a system of rice intensification (SRI) in Madagascar identifies a strong influ-

ence of learning from neighbors. The authors identify high rates of farmer exit from the technology, a village-level mean disadoption rate of 40 percent over seven years of exposure to SRI. They find that learning effects, captured by a dummy variable representing farmer membership in a farm organization, are a strong influence on both a farmer's initial adoption decision and his later decision to continue or abandon the technology. Lee and Neill (2001) study the adoption and disadoption dynamics of an initially successful system of maize-bean crop rotation in Honduras but there is no social component to their estimation.

Market exit is a potentially important source of information about market adoption and several case studies suggest that disadoption or exit from modern value chains and markets is widespread. We see a significant amount of churning around participation in Nicaraguan supermarket supply chains (see below) and researchers have documented farmer exit from modern output markets in other parts of the world including South Asia (Ruben *et al.*, 2007), Brazil and Argentina (Reardon and Farina, 2000), and Guatemala (Jano and Mainville, 2006).

Failure to account for exit from either a technology or an output market implies an assumption that these choices are irreversible. Yet the large number of exits observed in the dynamic process of market participation in Nicaragua and elsewhere suggests that the superior technology assumption in target input models built on Foster and Rosenzweig (1995) – that a new technology is an absorptive state – is not appropriate. Moreover, possible pecuniary externalities of new entrants into a market on existing suppliers are not permitted by standard household technology adoption models, which are purely partial equilibrium

without externalities other than learning.

Our analysis allows for the influence of neighbors' exit and experience on a farmer's decision to participate in a supermarket supply channel. Our method and results raise interesting questions about the optimal sequence and level of farmer market participation and exit. When high yielding crop varieties allow all farmers to benefit without concern for pecuniary externalities the policy question has generally been how to efficiently promote universal adoption. Yet the same is not necessarily true for market participation; the case of modern markets is more ambiguous. How do farmers learn from one another's experimentation in markets? What are the optimal community-level adoption dynamics? Can a farmer's exit from a modern market have a net positive externality in the community? Under what conditions might exit improve total social welfare?

4.3 Lifecycle model

We use a simple model of lifetime utility maximization to analyze the farmer's market participation decision. Building on the insights of the social networks and technology adoption literature, we expect that farmers learn about the profitability of a new marketing channel relative to the traditional market not only from their own experience, S_{it}, and exit, Z_{it}, but also from their neighbors in two ways. Farmers learn both from neighbors' accumulating experience in the supply chain, S_{-it}, and from neighbors' exit, Z_{-it}. We assume that these informational sources enter separately into the farmer's decision problem and that the farmer making a decision at the start of time t uses the realized experience, exit,

and asset variables from the previous period, $t-1$.

Beliefs about the profits from the modern marketing channel, π_t^m, are increasing in S_{it} and S_{-it} and decreasing in Z_{it} and Z_{-it}. Neighbors' experience and the farmer's own experience reflect learning about optimal input levels and investment in the contract relationship conditional on participation, as in Foster and Rosenzweig (1995) and other subsequent papers, while neighbors' exits Z_{-it} reflect the probability that the profitability of the modern market is less than the profitability of the conventional spot market, $\pi^m < \pi^c$, which would have induced others to exit.

Our model and estimation take supply chain placement as a given. That is, we do not model the determinants of the situating of supply chains and sequential selection of farmers. In each period, the farmer chooses whether to participate in the supply chain or not, $a_{it} \in [0,1]$, to maximize his utility $u(.)$:

$$u(a_{it}E\pi_t^m(S_{it}, S_{-it}, Z_{it}, Z_{-it}, A_{it}, I_{it}) + (1-a_{it})\pi^c) \tag{4.1}$$

with $\frac{\partial E\pi^m}{\partial S_{it}} > 0$, $\frac{\partial E\pi^m}{\partial S_{-it}} > 0$, and $\frac{\partial E\pi^m}{\partial Z_{-it}} < 0$. The farmer's period t uncertainty about the profitability of the modern marketing channel relative to the traditional channel is a result of uncertainty over, for example, the optimal investment level in a market with quality assessment, in post-harvest technology, negotiations, coordination, etc. In comparison, at time $t=0$ the distribution of the traditional market is known as is the relationship of the central moments of the traditional market distribution to farmer investment. As modeled in Equation 4.1, π^c is deterministic.

The farmer's unconditional maximization problem can be written as the so-

lution to the dynamic programming problem:

$$V_t(S_{it-1}, S_{-it-1}, Z_{it}, Z_{-it-1}, A_{it-1}, I_{it-1}) = \tag{4.2}$$
$$\max_{a_s} E_t \sum_{s=t}^{T} \theta^{s-t}(a_s \pi_s^m(S_{is-1}, S_{-is-1}, Z_{is-1}, Z_{-is-1}, A_{is-1}, I_{is-1}) + (1 - a_s)\pi^c)$$

where S_{it} represents the farmer's own cumulative experience, S_{-it-1} the farmer's neighbors' cumulative experience, Z_{it} the farmer's own exit, Z_{-it} neighbors' cumulative exits, A_{it} the farmer's assets, I_{it} the farmer's irrigation, and $\theta \in [0, 1]$ the discount factor. Equation 4.3 can be rewritten using Bellman's equation:

$$V_t(S_{it-1}, S_{-it-1}, Z_{it-1}, Z_{-it-1}, A_{it-1}, I_{it-1}) = \tag{4.3}$$

$$max_{a_{it}}(1 - a_{it})\pi^c + a_{it}E_t\pi_t^m(S_{it-1}, S_{-it-1}, Z_{it-1}, Z_{-it-1}, A_{it-1}, I_{it-1})$$
$$+\theta E_t V_{t+1}(S_{it}, S_{-it}, Z_{it}, Z_{-it}, A_{it}, I_{it})$$

The farmer's choice of a_{it} in period t both directly affects his utility in period t through changes in period t profit and also affects the optimal choice of a_{it+1} in the next period through changes in expected future profitability due to an increased stock of own experience, S_{it}.

We can solve for the farmer's optimal solution to the value function at $t = 0$. The first order condition is:

$$\frac{\partial V_t}{\partial a_{it}} : 0 \leq -\pi^c + E_t\pi_t^m + \theta E_t(\frac{\partial V_{t+1}}{\partial a_{it}}) \tag{4.4}$$

which at time t=0 can be written:

$$\pi^c - E_t\pi_t^m \leq \theta(V_1(1) - V_1(0)) \tag{4.5}$$

Equation 4.5 tells us that in period $t = 0$ the farmer will adopt as long as the expected difference in profits is less than the discounted value of the information he gains from participation.

A coordination problem results if farmer's own participation in time t, a_{it} (assuming that a_{it} is continuous) is increasing in his own assets A_{it} or irrigation I_{it}. If this is the case for all farmers ($\frac{\partial a_{-i}}{\partial A_{-i}} > 0$ or $\frac{\partial a_{-i}}{\partial I_{-i}} > 0$) then an individual's lifetime utility will be increasing in neighbors' participation and asset and irrigation stocks. If these cross-partials hold, there will be incentive for farmers to delay participation and free-ride on the accumulating experimentation of neighbors, i.e. to engage in strategic delay.

The special challenge of moving from modeling technology adoption to market participation is that the purchaser may be directly or indirectly determining the entry or exit of community farmers. A central challenge in this and similar work is whether we can distinguish between correlated outcomes. Here, we must distinguish between the supermarket offering farmers in a community a coordinated set of offers and the participation decision being mediated through social learning or diffusion. The effect in the data that we see for both of these phenomenon is correlated market participation.

Our model and estimation take the locations of the supply chains and farmers as given. We observe the full set of participants in the villages and argue that this set of farmers was free to enter or exit the supply chain at any time, conditional on the annual expansion of the supermarket supply chain supplier

network. This is a reasonable assumption in the case of Nicaragua, where supermarket managers pit six roving buyers against one another, using competition between regions to guarantee that weekly supply quantities are met at the lowest prices possible. Under pressure to meet strict regional quotas, the sourcing has been historically chaotic. Buyers often over-commit with suppliers and a farmer in a supply community would be largely free to determine his own entry into the marketing chain, once the buyer was purchasing in his village. Our results therefore seem most likely to describe social processes rather than a coordinated roll-out of contracting offers by the supermarket.

4.4 Descriptives and construction of variables

The data were gathered in Nicaragua between September 2007 and July 2008 in collaboration with the Nitlapan Institute at the Universidad Centro Americana and funded by the Social Science Research Council and the United States Agency for International Development (USAID) Assets and Market Access Collaborative Research Support Program (AMA CRSP). Two primary supermarket retail corporations operate in Nicaragua: the ten-store domestic chain La Colonia, and Wal-mart International, which purchased a controlling share in Dutch AHOLD's Central American holdings in 2006. By 2009, Wal-Mart had 46 Nicaraguan outlets. Michelson *et al.* (2010) describe the sector, the evolution of respective procurement structures and the growth in retail and sourcing in the Nicaraguan supermarket sector since 2000.

Researchers collected household and community-level data for 397 supplier households in 141 communities. The 397 surveyed supermarket supplier farm-

ers comprise the small population of Nicaraguan farmers who supplied horticulture to the two primary supermarket companies over some period between 2001 and 2008. As a part of a comprehensive household survey, suppliers were asked to recall their history of participation in the supermarket supply chain, including the years that they entered and, if they had exited by 2008, the year that they exited.

Communities are defined administratively. Farmers are grouped by the name of the community where they gave their residence and these groupings were confirmed by GPS coordinates taken at the time of the interview. We drop from the sample any communities where only one farmer supplied the supermarket between 2001 and 2008, leaving 322 suppliers in 66 communities. The supplier population in each community is defined as all suppliers who sold to the supermarket between 2001 and 2008.

The first two rows of Table 4.1 presents the annual share of total community participants supplying the supermarket and the annual share of community participants that had exited, by year. The mean participant share increases until 2006, plateaus in 2007, and decreases in 2008. The mean share of exits (as a share of total community suppliers) is by construction cumulative and therefore increases steadily over the eight year period. By 2008, the mean exit share is nearly half of all suppliers who ever joined the supply chain between 2001 and 2008. The estimations for the determinants of the decision to participate in time t use the $t-1$ variables for neighbors' and own experience and exits, assets, and irrigation. For this reason the 2001 column is blank in Table 4.1. Very few farmers participated in 2000 and we do not observe experience variables until 2001.

Table 4.1: Descriptive statistics, 2001-2008.

Descriptive statistics, 2001-2008

	2001	2002	2003	2004	2005	2006	2007	2008
Participant share	0.07	0.12	0.20	0.28	0.45	0.61	0.60	0.55
Exit share	0.0	0.01	0.04	0.07	0.11	0.21	0.37	0.45
Own experience, S_{it}	.	0.07	0.04	0.05	0.08	0.11	0.14	0.17
	.	(0.26)	(0.13)	(0.16)	(0.19)	(0.22)	(0.24)	(0.25)
Own exit, Z_{it}	.	0.0	0.01	0.02	0.03	0.04	0.07	0.11
	.	(0.0)	(0.06)	(0.09)	(0.12)	(0.14)	(0.17)	(0.19)
Neighbors' experience S_{-it}	.	0.07	0.04	0.06	0.10	0.13	0.19	0.25
	.	(0.18)	(0.09)	(0.12)	(0.13)	(0.15)	(0.15)	(0.14)
Neighbors' exits Z_{-it}	.	0.0	0.01	0.02	0.03	0.04	0.07	0.11
	.	(0.0)	(0.03)	(0.06)	(0.07)	(0.09)	(0.12)	(0.14)
Own assets (index)	.	-0.21	-0.17	-0.10	-0.01	0.11	0.23	0.35
	.	(0.55)	(0.57)	(0.62)	(0.69)	(0.79)	(0.83)	(0.86)
Neighbors' assets (mean)	.	-0.21	-0.17	-0.10	-0.01	0.11	0.23	0.35
	.	(0.36)	(0.37)	(0.41)	(0.48)	(0.55)	(0.58)	(0.62)
Own irrigation (mzs)	.	0.27	0.30	0.39	0.45	0.53	0.59	0.67
	.	(0.83)	(0.86)	(1.04)	(1.12)	(1.15)	(1.17)	(1.21)
Neighbors' irrigation (mean mzs)	.	0.27	0.30	0.39	0.44	0.53	0.59	0.67
	.	(0.62)	(0.63)	(0.67)	(0.70)	(0.74)	(0.76)	(0.80)
Non tenure-weighted experience variables								
Neighbors' experience	.	0.07	0.13	0.23	0.34	0.56	0.82	0.97
	.	(0.18)	(0.23)	(0.27)	(0.30)	(0.33)	(0.24)	(0.13)
Neighbors' exits	.	0.0	0.12	0.03	0.06	0.11	0.21	0.37
	.	(0.0)	(0.07)	(0.12)	(0.15)	(0.20)	(0.30)	(0.37)

Note: standard errors in parentheses.

Participation experience variables

We use four measures of experience in our model and estimations: own experience, own exit, neighbors' experience, and neighbors' exit. First, as a measure of own experience, we use the sum of years the farmer participated up to time t divided by t, the number of years of supermarket exposure [1], for example, $\sum_{t=1}^{T} t = 1$ in 2001, $\sum_{t=1}^{T} t = 2$ in 2002, etc.:

$$S_{it} = \frac{\sum_{t=1}^{T} (a_{it} | a_{it} = 1)}{\sum_{t=1}^{T} t} \tag{4.6}$$

Second, as a measure of farmer's own exit, z_{it} is equal to one in the year of exit and all subsequent years and zero before and during participation. The z_i's are summed over t and divided by t to yield Z_{it}:

$$Z_{it} = \frac{\sum_{t=1}^{T} (z_{it} | z_{it} = 1)}{\sum_{t=1}^{T} t} \tag{4.7}$$

As a measure of neighbors' experience, we use the sum of all neighbors' years of experience in the supply chain divided by the number of neighbor-observation years at time t. These are the tenure-weighted measures of neighbor experience. For community j with a size n supplier population:

[1] Years of supermarket exposure is defined as the years elapsed since Nicaragua's period of supermarket intensfication began in 2001.

$$S_{-it} = \frac{\sum_{k \neq i}^{n} \sum_{t=1}^{T} (a_{kt} | a_{kt} = 1)}{(n_j - 1) \sum_{t=1}^{T} t} \tag{4.8}$$

Cumulative neighbor exits in community j are constructed just as experience was. As with the measure of individual exit, neighbors' exit z_{-it} is equal to one in the year of exit and all subsequent years:

$$Z_{-it} = \frac{\sum_{k \neq i}^{n} \sum_{t=1}^{T} (z_{kt} | z_{kt} = 1)}{(n_j - 1) \sum_{t=1}^{T} t} \tag{4.9}$$

We also construct and present in the last rows of Table 4.1 measures of experience and exit which disregard the tenure of neighbors' experience in the supply chain. In these non-tenure-weighted measures each neighbors' entry and exit from the supply chain is counted once, rather than weighted by the length of his relationship with the supermarket or the time since exit. These sums are normalized by the total number of suppliers in the community, rather than the total number of supplier-years.

The difference between the two sets of experience variables is that the non-tenure-weighted measures give relatively more informational weight to farmers with short spell length. The non-tenure-weighted neighbor experience will approach the community participation share in 2008 (the community mean value in Table 4.1 is 0.55), and the non-tenure-weighted exit variable will approach the proportion of exits in 2008. The correlations between these variables decrease over time (as the number of participation years grows). The neighbors' expe-

rience variables are equivalent in $t = 1$ and the correlation decreases to 0.23 in 2008. The exit variable correlation is 0.86 in 2008.

Tenure-weighted measures are a continuous measure of neighbor experience and capture mean neighbor spell-length in the supply chain. If both a neighbor's entry and length of supply relationship provide information to the farmer than the number of total neighbor farmer-years in the supply chain will be a better measure of the farmer's full information set. We therefore run the estimations with both sets of experience variables, tenure-weighted and not.

Also Table 4.1 includes annual mean asset holdings and irrigation. Assets are compiled into an index using factor analysis, (Sahn and Stifel, 2000); we include details regarding computation of the asset index in the first appendix. Mean values suggest a pattern of asset and irrigation accumulation among participants between 2001 and 2008. Note that because we report mean values, the mean of own experience, assets, and irrigation are nearly equivalent to neighbors' experience, assets, and irrigation.

4.5 Estimation method

We are interested in the likelihood of participation, which depends on farmer observed and unobserved characteristics as well as community characteristics. If the unobserved farmer characteristics are uncorrelated with the set of observed explanatory variables, they are in the error term. If, however, the unobserved and the independent variables have some correlation, the omitted variables will bias the parameter estimates. In the case of market participation, it is likely that there is some relationship between ability or risk preferences or

unobserved social connections that is associated also with asset or irrigation holdings and participation. The trouble is that we cannot use fixed effects in binary panel data. Because the logit model is non-linear, fixed effects lead to inconsistent estimation of the coefficients.

Chamberlain (1984), proposed a method for fixed effects in logit models that involves maximizing a conditional likelihood function. Using this conditional logit model we can control time-constant unobserved farmer heterogeneity. The logit distribution for participation is written:

$$P(a_{it} = 1|\beta, \gamma, x_{it}, z_{it}, \delta_i) = \frac{\exp(\beta' x_{it} + \gamma' z_{it} + \delta_i)}{1 + \exp(\beta' x_{it} + \gamma' z_{it} + \delta_i)} \tag{4.10}$$

Where a_{it} is a binary variable equal to one if farmer i decides to participate in the market at time t and equal to zero otherwise. The estimable coefficients β and γ are vectors, x_{it} is a matrix of observed variables that influence participation, z_{it} are our own and neighbors' experience variables of interest, and δ_i is a time-invariant unobserved individual-specific parameter that influences participation.

Chamberlain (1984) argues that a sufficient statistic for the farmer effect, δ_i, is $\sum_{t=1}^{T} a_{it}$, the farmer proportion of observed positive outcomes. Here, we are conditioning on the number of years that an individual farmer participated in the supply chain. The δ estimated determines the overall proportion of participation years for any farmer, and β, γ, z and x determine the years in which the farmer's participation is most likely.

Following Madalla (1987), consider the case of the fixed effects logistic function where the number of time periods equals $T = 2$. Four patterns of partici-

pation in the supermarket supply chain are possible: the farmer can participate and then not participate (1,0), not participate and then participate (0,1), or participate or not participate in both periods (1,1) or (0,0), respectively. Cases in which participation does not change over the full tenure of the observations, where $\sum a_{it} = T$ or $\sum a_{it} = 0$, don't contribute any information to the conditional likelihood function and are discarded.

It can be shown (Maddala, 1987) that for $T = 2$:

$$P(0,1) = \frac{1}{1 + \exp(\beta' x_{i1} + \gamma' z_{i1} + \delta_i)} * \frac{\exp(\beta' x_{i2} + \gamma' z_{i2} + \delta_i)}{1 + \exp(\beta' x_{i2} + \gamma' z_{i2} + \delta_i)} \tag{4.11}$$

$$P(1,0) = \frac{\exp(\beta' x_{i1} + \gamma' z_{i1} + \delta_i)}{1 + \exp(\beta' x_{i1} + \gamma' z_{i1} + \delta_i)} * \frac{1}{1 + \exp(\beta' x_{i2} + \gamma' z_{i2} + \delta_i)} \tag{4.12}$$

And that the conditional probability when $T = 2$:

$$P[(1,0)|(1,0) \text{ or } (0,1)] = \frac{P(1,0)}{P(1,0) + P(0,1)} = \frac{\exp[\beta'(x_{i1} - x_{i2}) + \gamma'(z_{i1} - z_{i2})]}{1 + exp[\beta'(x_{i1} - x_{i2}) + \gamma'(z_{i1} - z_{i2})]} \tag{4.13}$$

Maddala (1987) presents the $T = 3$ case. Two participation sets must be considered, $\sum_{t=1}^{T} a_{it} = 1$ and $\sum_{t=1}^{T} a_{it} = 2$. For a general T, one considers the sets $\sum_{t=1}^{T} a_{it} = 1, 2, ...(T-1)$. For example, for the set $\sum_{t=1}^{T} a_{it} = 1$, when an individual participates in one of three years we derive:

$$P(1,0,0 \mid \sum_{t=1}^{T} a_{it} = 1) = \frac{exp[\beta'(x_{i1} - x_{i3})]}{1 + exp[\beta'(x_{i1} - x_{i3})] + exp[\beta'(x_{i2} - x_{i3})]}$$

$$P(0,1,0 \mid \sum_{t=1}^{T} a_{it} = 1) = \frac{exp[\beta'(x_{i2} - x_{i3})]}{1 + exp[\beta'(x_{i1} - x_{i3})] + exp[\beta'(x_{i2} - x_{i3})]}$$

$$\text{and} \quad P(0,0,1 \mid \sum_{t=1}^{T} a_{it} = 1) = \frac{1}{1 + exp[\beta'(x_{i1} - x_{i3})] + exp[\beta'(x_{i2} - x_{i3})]}$$

And for the set $\sum_{t=1}^{T} a_{it} = 2$,

$$P(0,1,1 \mid \sum_{t=1}^{T} a_{it} = 2) = \frac{exp[\beta'(x_{i2} - x_{i3})]}{1 + exp[\beta'(x_{i2} - x_{i3})] + exp[\beta'(x_{i2} - x_{i1})]}$$

$$P(1,0,1 \mid \sum_{t=1}^{T} a_{it} = 2) = \frac{exp[\beta'(x_{i2} - x_{i1})]}{1 + exp[\beta'(x_{i2} - x_{i3})] + exp[\beta'(x_{i2} - x_{i1})]}$$

$$\text{and} \quad P(1,0,1 \mid \sum_{t=1}^{T} a_{it} = 2) = \frac{1}{1 + exp[\beta'(x_{i2} - x_{i3})] + exp[\beta'(x_{i2} - x_{i1})]}$$

The estimating equation for the general case is:

$$\mathrm{P}(\mathrm{a}_i = 1 | x_{it-1}, x_{it}, z_{it-1}, z_{it}, \textstyle\sum a_{it} = 1) =$$

$$G[\beta(x_{t-1} - x_t) + \gamma_1(S_{it-1} - S_{it}) + \gamma_2(S_{-it-1} - S_{-it}) + \gamma_3(Z_{-it-1} - Z_{-it}) + \gamma_4(Z_{it-1} - Z_{it})] \quad (4.14)$$

where G is the logistic distribution. In equation 4.14, we break the experience vector z into its components: own experience, S_{it}, neighbor experience, S_{-it}, own exit, Z_{it}, and neighbor exit, Z_{-it}. The x vector includes annual own and neighbors' mean asset and irrigation stocks; β_1 and β_2 are estimated coefficients on own and neighbor assets and β_3 and β_4 are estimated coefficients on own and neighbors' irrigation.

Given that participation status changed for farmers between 2001 and 2008, this model can explain the probability that the farmer joined the supply chain. We estimate the parameters of interest on neighbors' experience and exit, purged of bias resulting from any time-invariant omitted variables.

The dependent variable, farmer participation in year t, is equal to one if he or she sold to the supermarket during a given year and zero otherwise. We use annual dummy variables for the years 2001 to 2008 to capture changes in supermarket purchasing trends and strategies over the sample period. We also condition on prior period $t-1$ participation status.

Based on the predictions from the lifecycle model in Section 4.3 we use the $T = 7$ expansion of equation 4.14 to test the following hypotheses:

1. Farmers' participation in the supply chain is positively influenced by own experience:
   $H_0 : \gamma_1 = 0$ vs. $H_A : \gamma_1 > 0$
2. Farmers' participation in the supply chain is positively influenced by neighbors' cumulative participation:
   $H_0 : \gamma_2 = 0$ vs. $H_A : \gamma_2 > 0$
3. Farmers' participation in the supply chain is negatively influenced by neighbors' cumulative exits from the supply chain:
   $H_0 : \gamma_3 = 0$ vs. $H_A : \gamma_3 < 0$
4. Farmers' participation in the supply chain is negatively influenced by his own exits from the supply chain:
   $H_0 : \gamma_4 = 0$ vs. $H_A : \gamma_4 < 0$
5. Farmers' participation in the supply chain is positively influenced by his asset holdings:
   $H_0 : \beta_1 = 0$ vs. $H_A : \beta_2 < 0$
6. Farmers' participation in the supply chain is negatively influenced by neighbors' mean asset holdings (evidence of strategic delay):
   $H_0 : \beta_2 = 0$ vs. $H_A : \beta_2 < 0$

7. Farmers' participation in the supply chain is positively influenced by his irrigation:

   $H_0 : \beta_3 = 0$ vs. $H_A : \beta_3 < 0$

8. Farmers' participation in the supply chain is negatively influenced by neighbors' mean irrigation (evidence of strategic delay):

   $H_0 : \beta_4 = 0$ vs. $H_A : \beta_4 < 0$

9. On the margin, observing a neighbors' exit from the supply chain is a stronger influence on farmer participation than observing additional neighbors' participation:

   $H_0 : |\gamma_3| = |\gamma_2|$ vs. $H_A : |\gamma_3| > |\gamma_2|$

Using interaction terms, we can also test whether the relative marginal effect of observing neighbor entrance versus exit is stronger for a farmer already participating than a farmer yet to enter the supply chain. We use quadratic terms to test for diminishing returns to farmer observations of neighbors' and own experience and exits, S_{it}, S_{-it}, Z_{it}, and Z_{-it}.

4.6 Results

Resultsfrom all models suggest a strong significant influence of neighbors' exit on farmers' participation decision. Tables 4.2 and 4.3 present the results from the six specifications of the fixed effects conditional logit models. Results are largely consistent across the six specifications. Neighbors' exit in time $t-1$ is a strong negative predictor of the farmer's participation in time t. Likewise mean neighbor assets in time $t-1$ are a strong negative predictor of a farmer's participation in time t, evidence of strategic delay. On the margin, observing a neighbors' exit

from the supply chain is a stronger influence on farmer participation than observing additional neighbors' participation and we reject the hypothesis that the absolute values of γ_2 and γ_3 are equal (χ^2= 0.34). Surprisingly, a farmer's own experience is an overall negative predictor of participation in the following period. This may reflect the fact that the likelihood of farmer exit is increasing in years of experimentation and may be evidence of the decreasing profitability of the supply relationship as more farmers in the community and/or region enter the supply channel.

Model (1) uses the tenure-weighted neighbor experience variables. In Model (2) we test for the presence of quadratic effects on all experience variables; we find strong evidence of diminishing effects of neighbors' exit on the farmer's decision to enter. In all models, we reject the hypothesis that the absolute values of the coefficients on neighbors' exit and neighbors' experience are equivalent. In all models, neighbors' exit is a significantly stronger determinant than neighbors' experience. Model (3) adds the effects of interactions between neighbor participation and exit with the farmer's $t-1$ participation status. Model (3) therefore permits comparison of the effect of viewing additional neighbors' experience or neighbor exits on farmers who have not yet entered the channel vs. the effect of those variables on farmers who are already in the supply chain. Models (4), (5), and (6) rerun Models (1), (2), and (3) but using the non tenure-weighted neighbor experience variables.

Table 4.2: Results of conditional logit regression predicting participation choice with tenure-weighted neighbor experience variables.

Dependent variable: Participation ($a_i = 1$) or not ($a_i = 0$) at time t

	Model (1)			Model (2)			Model (3)		
	Coefficient estimate	Std error	Odds ratio e^b	Coefficient estimate	Std error	Odds ratio e^b	Coefficient estimate	Std error	Odds ratio e^b
S_{it-1}: Own experience	-20.76***	(1.71)	<0.000	-27.45***	(2.57)	<0.000	-26.85***	(2.58)	<0.000
S^2_{it-1}				11.06***	(3.74)		10.00***	(3.76)	
Z_{it-1}: Own exit	-167.55	(9310)	<0.000	-225.51	(11974)	<0.000	-218.35	(5427)	<0.000
Z^2_{it-1}				232.51	(18802)		228.90	(7844)	
S_{-it-1}: Neighbors' experience	5.88***	(1.66)	356.24	-2.74	(2.15)	0.06	-3.71	(3.51)	0.02
S^2_{-it-1}				13.81***	(4.19)		15.56***	(4.27)	
Z_{-it-1}: Neighbors' exit	-7.52***	(1.76)	0.0005	-9.99***	(3.71)	<0.000	-6.58*	(4.12)	0.001
Z^2_{-it-1}				11.42*	(6.88)		14.12*	(7.59)	
A_{it-1}: Own assets	0.27	(0.40)	1.31	0.34	(0.42)	1.41	0.29	(0.41)	1.33
A_{-it-1}: Mean assets	-3.10***	(0.60)	0.05	-2.72***	(0.65)	0.07	-2.80***	(0.66)	0.06
I_{it-1}: Own irrigation	-0.14	(0.32)	0.87	-0.11	(0.34)	0.90	-0.12	(0.34)	0.89
I_{-it-1}: Mean irrigation	-0.06	(0.49)	0.94	0.23	(0.52)	1.25	0.24	(0.53)	
Participation at time $(t-1)$	-3.35***	(0.33)	0.04	-3.58***	(0.36)		-3.41***	(0.40)	1.27
Interactions									
Neighbors' experience * Participation in $(t-1)$							-0.03	(1.43)	0.97
Neighbors' exits * Participation in $(t-1)$							-4.25*	(2.37)	0.01
Year dummies									
2003	3.09***	(0.54)		3.35***	(0.56)		3.33***	(0.56)	
2004	6.65***	(0.65)		7.04***	(0.68)		6.95***	(0.69)	
2005	10.18***	(0.81)		10.86***	(0.86)		10.71***	(0.86)	
2006	13.33***	(1.01))		14.24***	(1.08)		14.14***	(1.08)	
2007	15.84***	(1.18)		17.02***	(1.28)		16.91***	(1.28)	
2008	18.50***	(1.38)		19.94***	(1.49)		19.83***	(1.50)	
n	2079			2079			2079		
pseudo R^2	0.70			0.72			0.72		

Note: *, **, *** indicate statistical significance at the ten, five, and one percent levels, respectively. A fourth model with interactions but no quadratics yields results similar to Model (1): own and neighbors' experience, neighbors' exit, and neighbors' assets are significant statistically and economically with magnitude similar to Model (1). The interaction terms are not significant.

Table 4.3: Results of conditional logit regression predicting participation choice with non tenure-weighted neighbor experience variables.

Dependent variable: Participation ($a_i = 1$) or not ($a_i = 0$) at time t

	Model (4)			Model (5)			Model (6)		
	Coefficient estimate	Std error	Odds ratio e^b	Coefficient estimate	Std error	Odds ratio e^b	Coefficient estimate	Std error	Odds ratio e^b
S_{it-1}: Own experience	-19.55***	(1.63)	<0.000	-28.05***	(2.47)	<0.000	-27.42***	(2.48)	<0.000
S^2_{it-1}				18.93***	(2.74)		18.46***	(2.65)	
Z_{it-1}: Own exit	-168.42	(6177)	<0.000	-255.56	(15376)	<0.000	-325.91	(401386)	<0.000
Z^2_{it-1}				291.67	(21591)		385.06	(561944)	
S_{-it-1}: Neighbors' experience	-0.09	(0.46)	0.92	1.70	(1.30)	5.48	0.73	(1.35)	2.08
S^2_{-it-1}				-1.71	(1.15)		-0.37	(1.27)	
Z_{-it-1}: Neighbors' exit	-1.88***	(0.62)	0.15	-4.38***	(1.67)	0.01	-2.55	(1.88)	0.08
Z^2_{-it-1}				3.33*	(1.84)		4.46**	(1.91)	
A_{it-1}: Own assets	0.43	(0.39)	1.54	0.42	(0.40)	1.52	0.31	(0.40)	1.36
A_{-it-1}: Mean assets	-2.21***	(0.63)	0.11	-2.78***	(0.67)	0.06	-3.01***	(0.67)	0.05
I_{it-1}: Own irrigation	-0.12	(0.32)	0.88	-0.03	(0.34)	0.97	-0.04	(0.33)	0.96
I_{-it-1}: Mean irrigation	-0.17	(0.49)	0.84	-0.16	(0.50)	0.85	-0.19	(0.50)	0.83
Participation at time $(t-1)$	-3.29***	(0.34)	0.04	-3.18***	(0.34)	0.04	-2.34***	(0.47)	0.10
Interactions									
Neighbors' experience * Participation in $(t-1)$							-1.11	(0.70)	0.33
Neighbors' exits * Participation in $(t-1)$							-2.80**	(1.28)	0.06
Year dummies									
2003	2.76***	(0.51)		2.83***	(0.50)		2.77***	(0.50)	
2004	6.21***	(0.63)		6.27***	(0.64)		6.06***	(0.65)	
2005	9.67***	(0.80)		9.83***	(0.82)		9.54***	(0.83)	
2006	12.71***	(0.99)		13.03***	(1.03)		12.80***	(1.05)	
2007	15.35***	(1.18)		15.82***	(1.23)		15.66***	(1.25)	
2008	18.14***	(1.38)		19.03***	(1.45)		18.90***	(1.46)	
n	2079			2079			2079		
pseudo R^2	0.68			0.71			0.71		

Note: *, **, *** indicate statistical significance at the ten, five, and one percent levels, respectively. An additional model with interactions but no quadratics yields results similar to Model (4): own and neighbors' experience and neighbors' assets are significant statistically and economically with magnitude similar to Model (4). The interaction terms are also significant with magnitudes similar to Model (6).

Because the conditional logit fixed effects results are based only on the sample of farmers who joined the marketing channel between 2001 and 2008 but excludes those who do not change their participation status over this period (primarily those who never join as there are very few farmers who supply continuously between 2001 and 2008), the coefficients are relevant to a model of the likelihood of participation among farmers who have joined the supply chain. The sample excludes (and we do not observe) farmers who are dissuaded by their observations of neighbors' participation, outcomes, and exits, from ever joining. Because we do not observe farmers who saw the exits and experiences of neighbors in the community and never adopted, the total negative effect from learning neighbors' exit in the community may be larger than estimated here.

Is the effect of viewing a neighbor exit the supply chain stronger for a farmer who is already selling to a supermarket or for a farmer contemplating entry? Our results indicate that a farmer takes more seriously a neighbors' exit if the farmer is already himself in the channel. Interactions in Models (3) and (6) allow us to compare the relative influence of neighbors participation and exit depending on whether the deciding farmer is in or out of the supply chain. In both models we find evidence of a significantly stronger negative effect of neighbor exit on the participation of farmers in the supply chain than on farmers out of the supply chain. If a farmer is in the channel, a neighbor's exit yields an additional change in the log odds of participation in the subsequent year of 0.014 over the 0.001 base. This means that a farmer in the channel is ten percent less likely, relative to a farmer who is not in the channel, to participate in the supply chain if he witnesses an increase in the proportion of neighbors who have exited.

The year dummy variables are positive and significant, increasing in magnitude over time, demonstrating the aggregate growth in the number of total suppliers employed by the supermarket over the sample period.

Evidence of strategic delay, that farmer's own participation in t is significantly negatively influenced by his neighbors' mean asset levels, suggests further evidence that the effect we measure is a social process rather than a firm strategy of contract dissemination. In our analysis of farmer participation in the supply chain in Chapter 3 of this dissertation we find no evidence of selection of farmers on assets, suggesting that the firms are not targeting wealthier farmers first, delaying or withholding contracts to their poor neighbors. There is therefore no clear explanation of a significant negative relationship between farmer market participation and neighbor assets if the participation dynamics we document are exclusively firm-mediated.

4.7 Discussion and conclusions

This research investigates the existence of social influences on farmers' participation in modern markets. We use a panel of 397 farmers over seven years to control for farmer fixed effects in a conditional logit model of adoption. Consistent with the recent literature on social processes in technology adoption, our results support the hypotheses that farmers learn from neighbors' experience in and exit from a new marketing channel, not only regarding their initial adoption decision but even once they are already in the supply channel. That is, their subsequent decision whether to continue with the marketing channel once they have already entered is strongly influenced by the decision of their neighbors

to exit or continue. Farmers may be persuaded by their neighbors' exit that the channel is not as remunerative as expected or they may find in the subsequent period that there were scale economies in production or post-harvest processing that can no longer be realized with a smaller n. Evidence that likelihood of participation increased with the exit of neighbors would suggest that there were local gains to a neighbor's exit through increased own supply quantities for example. Our evidence does not support this hypothesis.

While data limitations require that we remain agnostic regarding whether the social phenomenon we document is social learning or mimicry, our results provide clear evidence that farmers' participation in modern markets is influenced through social processes. An implication both of the presence of strategic delay and of non-contracting farmers (who we do not observe) staying out of the modern channel based on the observed experiences of their neighbors is that, if there is a net cost to entry and exit, some farmers may pay a price for early experimentation. Our analysis cannot explain initial farmer entry into the supply chain and further study characterizing the participation of the first-adopter and the sequence of adoption would be interesting. A related issue for future study is whether farmers with limited community social connections might be excluded from information networks that would inform them about the profitability of a new marketing opportunity.

APPENDIX A

CALCULATION OF ASSET INDICES

Construction of an index of household assets requires reduction of the dimensionality of the asset portfolio. With household-specific data on asset prices that would capture quality differences, one might weight each household's assets by the household-specific vector of asset prices and sum weighted components of the portfolio of assets into a single measure. In the absence of such data, economists have turned to principal components analysis (Filmer and Pritchett, 2001; McKenzie, 2005; Moser and Felton, 2009; Vyas and Kumaranayake, 2006) and factor analysis (Naschold, 2009; Sahn and Stifel, 2000) to derive weights for an asset index.

The primary difference between principal components analysis and factor analysis is that principal components analysis assumes that all variability in an asset should be used in the analysis. In factor analysis, the relevant variance in an asset holding across households is only the variance that it shares with other assets. For this reason, factor analysis is often a preferred method for detecting structure among variables.

Lacking data on the quality of assets, we apply factor analysis to household asset holdings to derive two indices of asset holdings for two different years: productive assets in 2000 and 2007 and consumer durables in 2000 and 2007. Following Sahn and Stifel (2000), we assume the existence of a single common factor representing welfare that determines the variance in asset holdings across households. We use these indices in the analysis both as controls for 2000 wealth in the placement, selection, and welfare equations and as measures of 2007 household welfare themselves.

Factor analysis in the construction of asset indices is most effective when there is a high degree of correlation between assets but also variation in the distribution of correlated holdings across households. Therefore, to increase analytical and interpretive precision we break a households' assets in two classes: productive assets and consumer durables, calculating separate indices for each asset class. In this way we can differentiate household wealth in two dimensions in the analysis. Productive assets in the index are listed in Table A.1 and consumer durables in Table A.2. Productive assets include productive agricultural assets – durable assets of use in agricultural production or marketing such as farm tools, transportation, and communications technologies. Consumer durables includes the remainder of household durable assets. We exclude out durable assets for which we only observe 2007 levels – primarily information regarding conditions of the home such as number of rooms and the sources of water, light and and sanitation. Because we include landholdings and irrigation in 2000 and 2007 separately in the regressions they are not included in the construction of the asset indices.

Households in the sample exhibit a high range in portfolios of productive assets (Tables A.1 and A.2). The majority of households have at least one portable sprayer and many households report ownership of cellular phones and bicycles in 2007. However, some households have multiple forms of four-wheeled motorized transport, tractors, or grain storage silos.

To permit comparison of the indices across time, we pool observations on assets from 2000 and 2007. We find factor scores are positive for all durable assets. Results from the first factor of the factor analysis are presented in the far right column in Tables A.1 and A.2. Note that we present asset descriptive statistics

Table A.1: Results of principal components analysis, productive assets

Variable	Mean	Std. deviation	min	max	Factor score
Tractor, 2007	0.045	0.234	0	3	0.047
Tractor	0.031	0.199	0	3	
Ox plow, 2007	0.248	0.504	0	4	0.129
Ox plow	0.107	0.341	0	4	
Ox cart, 2007	0.140	0.412	0	6	0.076
Ox cart	0.066	0.283	0	4	
Portable sprayer, 2007	0.999	1.038	0	6	0.154
Portable sprayer	0.373	0.748	0	6	
Motorized sprayer, 2007	0.089	0.423	0	6	0.079
Motorized sprayer	0.019	0.151	0	2	
Chainsaw, 2007	0.042	0.232	0	3	0.128
Chainsaw	0.012	0.127	0	2	
Irrigation pump, 2007	0.260	0.570	0	5	0.087
Irrigation pump	0.050	0.223	0	2	
Electric generator, 2007	0.028	0.165	0	1	0.066
Electric generator	0.002	0.048	0	1	
Motorized transport*, 2007	0.127	0.452	0	7	0.108
Motorized transport	0.042	0.232	0	3	
Livestock corral, 2007	0.173	0.405	0	3	0.155
Livestock corral	0.111	0.332	0	3	
Pilas, 2007	0.182	0.506	0	4	0.121
Pilas	0.083	0.347	0	4	
Bodegas, 2007	0.067	0.309	0	5	0.217
Bodegas	0.039	0.252	0	5	
Grain storage silo, 2007	0.280	0.844	0	8	0.097
Grain storage silo	0.138	0.657	0	8	
Irrigation well, 2007	0.104	0.361	0	4	0.046
Irrigation well	0.059	0.272	0	3	
Represas, 2007	0.032	0.346	0	8	0.175
Represas	0.024	0.331	0	8	
Bicycle, 2007	0.468	0.707	0	4	0.073
Bicycle	0.067	0.285	0	3	
Motorcycle, 2007	0.059	0.268	0	3	0.045
Motorcycle	0.007	0.083	0	1	
Telephone, 2007	0.037	0.201	0	2	0.045
Telephone	0.007	0.096	0	2	
Cellular phone, 2007	0.480	0.749	0	5	0.108
Cellular phone	0.008	0.132	0	3	

*sum of all 4-wheeled vehicles including trucks, commercial trucks, and cars

Table A.2: Results of principal components analysis, consumer durables

Variable	Mean	Std. deviation	min	max	Factor score
Radio, 2007	0.459	0.512	0	3	0.023
Radio	0.144	0.354	0	2	
Television BW, 2007	0.139	0.362	0	3	0.020
Television BW	0.042	0.217	0	3	
Television Color, 2007	0.560	0.573	0	4	0.672
Television Color	0.094	0.336	0	3	
Refrigerator, 2007	0.252	0.450	0	3	0.703
Refrigerator	0.051	0.225	0	2	
Mixer, 2007	0.208	0.415	0	3	0.629
Mixer	0.0451	0.208	0	1	
Iron, 2007	0.429	0.520	0	3	0.587
Iron	0.098	0.302	0	2	
Grinder, 2007	0 .292	0.467	0	3	0.108
Grinder	0.089	0.285	0	1	
Tape recorder, 2007	0.164	0.380	0	2	0.228
Tape recorder	0.035	0.183	0	1	
Stereo equipment, 2007	0.247	0.437	0	2	0.632
Stereo equipment	0.029	0.174	0	2	
Electric fan, 2007	0.175	0.460	0	3	0.542
Electric fan	0.025	0.197	0	3	
Blender, 2007	0.177	0.394	0	2	0.675
Blender	0.034	0.180	0	1	
Toaster, 2007	0.013	0.112	0	1	0.205
Toaster	0.002	0.048	0	1	
Oven, 2007	0.017	0.131	0	1	0.204
Oven	0.006	0.076	0	1	
Microwave, 2007	0.035	0.183	0	1	0.407
Microwave	0.002	0.048	0	1	
Rice-maker, 2007	0.036	0.192	0	2	0.384
Rice-maker	0.005	0.068	0	1	
Washing machine, 2007	0.019	0.143	0	2	0.266
Washing machine	0.001	0.034	0	1	
Sewing machine, 2007	0.095	0.320	0	3	0.201
Sewing machine	0.032	0.177	0	1	
Boat, 2007	0.009	0.118	0	2	0.032
Boat	0.002	0.048	0	1	
CD player, 2007	0.126	0.353	0	4	0.441
CD player	0.002	0.048	0	1	
Books, 2007	1.30	34.187	0	1000	0.066
Books	1.28	34.186	0	1000	

disaggregated by years but because the year observations are pooled in the calculation of the index, the factor score is for the asset with years pooled and is not year-specific. The eigenvalue for the first factor of the productive asset factor analysis is 2.46 and explains 69.4 percent of the variation. For the consumer durables, the corresponding eigenvalue is 3.61, explainging 85.6 percent of the variation. Retention of only the first factor is necessary for computation of the index but here passes the Kaiser criterion (1960), which requires that all factors with eigenvalues greater than one be retained.

Table A.3: Correlations among computed asset indices, 2000 and 2007

	Productive assets, 2007	Productive assets, 2000	Consumer durables 2007
Productive assets, 2007			
Productive assets, 2000	0.781		
Consumer durables, 2007	0.416	0.319	
Consumer durables, 2000	0.342	0.357	0.545

Table A presents the correlation coefficients between productive and consumer durables indices for 2000 and 2007. As should be expected, there are strong correlations between household productive asset holdings between 2000 and 2007 as well as consumer durables indices across years. Relationships between consumer durables and productive assets for a given year are weaker.

APPENDIX B

INSTRUMENTAL VARIABLES

In this appendix we include in Tables B.1, B.2, and B.3 the results of the second stage instrumental variables regressions with different permutations of the instrumental variables set in the three first-stage regressions.

Each table includes in the first column the coefficient estimates from the instrumental variables welfare effects equations in Chapter 3. Subsequent columns run the same second stage regressions, with the same second and first stage controls, but iteratively subtract instruments from the set to check the sensitivity of the findings. The magnitude and sign of the significant coefficients exhibit minimal change and results from the three welfare effects estimations are found to be robust to variation in the set of instrumental variables employed.

Table B.1: Results of permutations of first stage regression instrument sets for second stage coefficient estimates regressing instrumental variables on 2007 per capita household income.

Dependent variable: Per capita Income (2007 USD)						
	(1)	(2)	(3)	(4)	(5)	(6)
Current supplier	791.65	760.48	346.52	323.49	-284.25	400.86
	(637.57)	(691.97)	(649.17)	(844.17)	(862.48)	(675.78)
Instrument set						
Years growing a horticulture/tuber crop	y	y	y	n	n	y
Land worked by household head parents (log mzs)	y	y	n	y	n	n
Altitude	y	n	y	y	y	n
Discontinued supplier	774.79	1143.92	-740.98	3139.60**	4036.47**	-415.85
	(258.14)	(1093.42)	(950.84)	(1575.34)	(1854.07)	(995.65)
Instrument set						
Longest relationship with horticulture/tuber/fruit buyer (log years)	y	y	n	y	y	n
Distance to closest retail outlet, 2000 (as the crow flies)	y	y	y	n	n	y
Altitude	y	n	y	y	n	n
Tenure supplier	130.67**	134.98**	127.91**	128.00**	131.84**	128.33**
	(60.44)	(65.99)	(64.32)	(63.11)	(66.68)	(62.61)
Instrument set						
Year of supply chain entry	y	y	y	y	y	y

Note: The original instrumental variables model from Table 3.7 is included for reference here as Model (1). Household demographic, community, regional, and crop controls are included regressors in all models.

Table B.2: Results of permutations of first stage regression instrument sets for second stage coefficient estimates regressing instrumental variables on irrigation change, 2008-2002.

Dependent variable: Irrigation change, 2008-2002					
	(1)	(2)	(3)	(4)	(5)
Current supplier	0.35***	0.39***	0.32***	0.35***	0.27**
	(0.12)	(0.13)	(0.12)	(0.15)	(0.13)
Instrument set					
Years growing a horticulture/tuber crop	y	y	y	n	n
Land worked by household head parents (log mzs)	y	n	n	y	y
Discontinued supplier	-0.37	-0.65	-0.11	-0.79**	-0.07
	(0.28)	(0.40)	(0.26)	(0.39)	(0.24)
Instrument set					
Longest relationship with horticulture/tuber/fruit buyer (log years)	y	n	y	n	y
Distance to closest retail outlet, 2000 (as the crow flies)	y	y	n	y	n
Tenure supplier	0.03	0.03	0.03	0.03	0.03
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Instrument set					
Year of supply chain entry	y	y	y	y	y

Note: The original instrumental variables model from Table 3.12 is included for reference here as Model (1). Household demographic, community, regional, and crop controls are included regressors in all models.

Table B.3: Results of permutations of first stage regression instrument sets for second stage coefficient estimates regressing instrumental variables on household asset accumulation, 2007-2000.

Dependent variable: Asset accumulation, 2007-2000						
	(1)	(2)	(3)	(4)	(5)	(6)
Current supplier	0.11	0.11	0.10	0.06	0.11	0.11
	(0.21)	(0.21)	(0.23)	(0.22)	(0.26)	(0.22)
Instrument set						
Years growing a horticulture/tuber crop	y	y	y	n	n	y
Land worked by household head parents (log mzs)	y	y	n	y	n	n
Altitude	y	n	y	y	y	n
Discontinued supplier	0.01	-0.40	-0.67*	0.10	0.03	-0.76*
	(0.22)	(0.32)	(0.39)	(0.29)	(0.30)	(0.41)
Instrument set						
Longest relationship with horticulture/tuber/fruit buyer (log years)	y	y	n	y	y	n
Distance to closest retail outlet, 2000 (as the crow flies)	y	y	y	n	n	y
Altitude	y	n	y	y	n	n
Tenure supplier	0.04**	0.04**	0.04**	0.04**	0.03*	0.04**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Instrument set						
Year of supply chain entry	y	y	y	y	y	y

Note: The original instrumental variables model from Table 3.11 is included for reference here as Model (1). Household demographic, community, regional, and crop controls are included regressors in all models.

APPENDIX C

REGRESSION RESULTS: FARMER INVESTMENT IN LAND, CONSUMER DURABLES (2008–2000) AND LIVESTOCK HOLDINGS (2007)

Table C.1: Results of OLS and instrumental variables (IV) regressions, effect of supplier-status on consumer durables accumulation, 2000-08

	Consumer durables index, Δ 2008–2000	
	(1)	(2)
Explanatory variables	OLS	IV
β_1 Supermarket supplier (0/1), level effect	0.19	-0.29
	(0.17)	(0.32)
α Relationship tenure (years), growth effect	-0.01	-0.02
	(0.03)	(0.05)
β_2 Discontinued supplier (0/1)	0.11	0.32
	(0.15)	(0.33)
Supermarket supplier*Basic grains before supplier	-0.06	-0.34
	(0.23)	(0.29)
Relationship tenure*Basic grains before supplier	-0.03	0.09
	(0.06)	(0.08)
Discontinued supplier*Basic grains before supplier	-0.08	-0.68**
	(0.19)	(0.35)
Supermarket supplier*NGO assisted	-0.07	-0.13
	(0.22)	(0.27)
Relationship tenure*NGO assisted	0.02	0.06
	(0.06)	(0.07)
Discontinued supplier*NGO assisted	0.34	0.01
	(0.24)	(0.35)
Productive Assets, 2000	0.22**	0.22*
	(0.10)	(0.11))
Consumer durables, 2000	-0.03	-0.89
	(0.07)	(0.08)
Land, 2000	0.001	0.08
	(0.002)	(0.002)
n	849	849
R^2	0.227	

Note: Errors are clustered at the community level and IV standard errors (2) are bootstrapped. Household demographic, community, regional, and crop controls are included regressors in all models.

Table C.2: Results of OLS and instrumental variables (IV) regressions, effect of supplier-status on land accumulation, 2000-08

	Landholdings change 2008–2000	
	(3)	(4)
Explanatory variables	OLS	IV
β_1 Supermarket supplier (0/1), level effect	0.71	-1.15
	(1.02)	(2.23)
α Relationship tenure (years), growth effect	0.10	0.22
	(0.20)	(0.33)
β_2 Discontinued supplier (0/1)	1.35	1.16
	(1.23)	(2.15)
Supermarket supplier*Basic grains before supplier	-1.90	-0.57
	(1.43)	(1.24)
Relationship tenure*Basic grains before supplier	0.50	0.30
	(0.51)	(0.46)
Discontinued supplier*Basic grains before supplier	-0.11*	-2.92
	(1.17)	(1.97)
Supermarket supplier*NGO assisted	-0.27	0.33
	(1.85)	(1.36)
Relationship tenure*NGO assisted	-0.20	0.37
	(0.40)	(0.56)
Discontinued supplier*NGO assisted	-1.25	-2.29
	(0.92)	(2.18)
Productive Assets, 2000	0.15	0.22
	(0.49)	(0.51)
Consumer durables, 2000	0.35	0.25
	(0.61)	(0.63)
Land, 2000	-0.05**	-0.05**
	(0.02)	(0.02)
n	830	830
R^2	0.342	

Note: Errors are clustered at the community level and IV standard errors in (4) are bootstrapped. Household demographic, community, regional, and crop controls are included regressors in all models.

Table C.3: Results of OLS and instrumental variables (IV) regressions, effect of supplier-status on 2007 livestock tropical livestock units (TLUs)

Dependent variable: Livestock TLU, 2007	(1) OLS	(2) IV
β_1 Supermarket supplier (0/1)	1.91	1.29
	(1.34)	(2.90)
α Relationship tenure (years)	-0.41*	-0.20
	(0.24)	(0.39)
β_2 Discontinued supplier (0/1)	0.66	0.002
	(1.36)	(3.24)
Supermarket supplier*Basic grains before supplier	-2.95*	-0.67
	(1.60)	(1.90)
Relationship tenure*Basic grains before supplier	0.60	0.14
	(0.43)	(0.50)
Discontinued supplier*Basic grains before supplier	2.53	0.37
	(1.79)	(3.14)
Supermarket supplier*NGO assisted	-1.92	-0.28
	(1.40)	(1.91)
Relationship tenure*NGO assisted	-0.03	-0.06
	(0.44)	(0.54)
Discontinued supplier*NGO assisted	1.81	-2.50
	(2.27)	(4.22)
Productive Assets, 2000	3.86***	3.92***
	(0.62)	(0.84)
Consumer durables, 2000	0.24	0.17
	(0.62)	(0.76)
Land, 2000	0.23***	0.22***
	(0.04)	(0.04)
n	840	840
R^2	0.451	

Note: Errors are clustered at the community level and IV standard errors (2) are bootstrapped. Household demographic, community, regional, and crop controls are included regressors in all models.

Estudio de Mercados Dinámicos
NITLAPAN, UCA
UNIVERSIDAD DE CORNELL
UNIVERSIDAD DE MICHIGAN STATE
MAYO DEL 2008

0.1 REGION_____[P_01]
0.2 → MUNICIPIO_____[P_02]
0.3 → DEPARTAMENTO_____[P_03]
0.4 → COMARCA_____[P_21]
0.5 → COMUNIDAD_____[P_22]
0.6 HOJA TOPOGRAFICA_____[P_04]
0.7 → COORDENADAS GPS_____[P_12]

0.8 Número de Boleta [P_05]

CLASIFICACIÓN MUESTRAL

0.9 ESTA BOLETA FORMA PARTE DE LA MUESTRA DE: [P_06]

PANEL	
PARTICIPANTS	
FORMULARIO DE SEGUIMIENTO DE TIERRA	

0.10. ¿CUÁL ES EL NUMERO DE BOLETA DE LA MUESTRA ORIGINAL? [P_07]

→ 0.11. NOMBRE DEL ENTREVISTADO [P_09 A] Y [P_09B]

→ 0.12. ¿EL ENTREVISTADO ES JEFE/JEFA DEL HOGAR? SI_____NO_____ [P0_10]
→ 0.13 ¿EL ENTREVISTADO ES LA MISMA PERSONA DE 0.14? SI_____NO_____ [P0_11]

DATOS DE 2000:
0.14 NOBRE DEL JEFE/JEFA DEL HOGAR

Seguimiento de Personas
→ EN CASO DE QUE NO SE PUEDA UBICAR AL JEFE O JEFA DE HOGAR O A SU CONYUGE (Ej. Si han migrado), LLENAR EL FORMULARIO SUPLEMENTARIO DE SEGUIMIENTO "A.1. SEGUIMIENTO DE PERSONAS." ESTA HOJA ES PARA SOLICITAR INFORMACION SOBRE LA FORMA EN QUE SE PUEDE LOCALIZAR A LA PERSONA QUE SE ENTREVISTO EN 2000 (A menos que haya muerto).

→ 0.15 Código del encuestador _____ [P0_13]
→ 0.16. Fecha de levantamiento _____ [P0_14]
→ 0.17 Hora de iniciar encuesta([P0_015])
→ 0.18 .am_____pm_____
→ 0.19.Hora que finaliza ([P0_17])
→ 0.20. am_____pm_____
→ 0.21.Código del supervisor _____ [P0_19]

Firma del supervisor:_____

Estrictamente Confidencial
Dirección del encuestado

_____

_____

_____**[DIRECCION]**_____

SECCIÓN 1. CARACTERIZACIÓN DE LA FAMILIA

Me podría decir el nombre de las personas que viven permanentemente en este hogar, *QUE PREPARAN Y COMPARTEN LOS ALIMENTOS Y DEPENDEN DEL JEFE DEL HOGAR.*

Cuadro 1A. Miembros actuales de la familia.

						Para Personas de 6 o más años de edad			
1. **Código Personal** [C1A_P1]	**2.** **Nombres y apellidos** **Registre el nombre de todas las personas que viven permanentemente en el hogar, que cocinan y comparten los alimentos, en el siguiente orden:** **Jefe ó jefa** **Cónyuge** **Hijos e hijas** **Parientes del jefe ó jefa** **No parientes del jefe ó jefa** [C1A_P2A]/[C1A_P2B]	**3.** **Identificación del encuestado** ***PONGA UNA "X" CON LA PERSONA QUE DIO LA ENTREVISTA*** [C1A_P3]	**4.** **¿Cuál es el parentesco que tienen estas personas con el jefe del hogar?** *1. Jefe* *2. Cónyuge* *3. Hijo/hija* *4. Padre/madre* *5. Abuelo/abuela* *6. Hermano/hermana* *7. Otro familiar* *8. No familiar* [C1A_P4]	**5.** **¿Sexo?** *1. M* *2. F* [C1A_P5]	**6.** **¿Edad?** *Años cumplidos (menos de 1 año=00)* [C1A_P6]	**7.** **¿Sabe leer?** *1. Si* *2. No* [C1A_P7]	**8.** **¿Cuál es el nivel de educación formal alcanzado?** *1. Ninguno* *2. Primaria Incompleta* *3. Primaria Completa* *4. Secundaria Incompleta* *5. Secundaria Completa* *6. Universidad Incompleta.* *7. Universidad Completa* *8. Técnico Medio* *9. Post Grado* *10. Alfabetizado* [C1A_P8]	**9.** **¿Asiste Actualmente a alguna escuela o centro de Enseñanza?** *1. Si* *2. No* [C1A_P9]	**10.** **¿Participa en la actividad agropecuaria del hogar?** *1.Si, permanentemente* *2.Si, temporalmente* *3. Casi nunca/nunca* [C1A_P10]
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

1.1 ¿Cuál es la altura del jefe/jefa de la casa? _____ [P1_1]_____

SECCIÓN 2. INGRESOS NO AGROPECUARIOS

2A. Trabajo Asalariado Temporal o Permanente

2.1 ¿En los últimos 12 meses, algún miembro del hogar trabajó para otra persona, finca o empresa - o permanente o temporalmente?

Sí……. 1 → ***REGISTRE LOS DATOS DE CADA ACTIVIDAD EN EL CUADRO 2A***
No…… 2 → ***PASE A LA PREGUNTA 2.2***

→MENCIONE EL NOMBRE DE CADA MIEMBRO MAYOR DE 12 AÑOS
→ REGISTRE CUALQUIER ACTIVIDAD PARA LA CUAL RECIBIO UN PAGO. SE INCLUYE, POR EJEMPLO, TANTO EL MIEMBRO QUE TRABAJO TRES JORNALES EN EL CORTE DE CAFE COMO EL MIEMBRO QUE TRABAJO TODO EL AÑO COMO MEDICO.

Cuadro 2A. Trabajo Asalariado (Venta de fuerza de trabajo por salario o por tarea)

1. No. de Orden [C2AYB_P1]	2. Código Personal *(de la página 1)* [C2AB_P2]	3. Tipo de Trabajo *1=Obrero agrícola 2=Obrero no agrícola 3=Profesional* [C2A_P3]	4. ¿Cuántos meses trabajó en los últimos 12 meses? (en este trabajo) *meses* [C2A_P4]	5. ¿Cuánto ganó en promedio por mes? *(incluya pago en efectivo, especie, y mano vuelta) C$* [C2A_P5]	6. Ingreso total en los ultimos 12 meses: *(4 X 5) C$* [C2A_P6]
1					
2					
3					
4					
5					
6					
7					
8					
9					

2B. Trabajo por Cuenta Propia

2.2 ¿En los últimos 12 meses, algún miembro del hogar ha manejado un negocio o trabajado por cuenta propia?

Sí……. 1 → ***REGISTRE LOS DATOS DE CADA ACTIVIDAD EN EL CUADRO 2B***
No…… 2 → ***PASE A LA PREGUNTA 2.3***

Cuadro 2B. Trabajo por Cuenta Propia

1. No. de orden [C2AYB_P1]	2. Tipo de negocio/ actividad *Clave 1* [C2B_P2]	3. ¿Quién maneja este negocio/actividad? *(Código personal)* [C2AYB_P2]	4. Además de esta persona: ¿Cuántos otros miembros del hogar trabajan regularmente en este negocio? [C2B_P3]	5. ¿En cuántos de los últimos 12 meses se realizó esta actividad/negocio? [C2B_P4]	En el último mes que se realizó esta actividad; ¿Cuáles fueron las: 6. ¿Ventas Brutas? *C$* [C2B_P5]	7. ¿Ganancias? *(ventas brutas menos costos globales)* *C$* [C2B_P6]	8. ¿Las ganancias de ese mes fueron: *1. Normales 2. Menos de normal 3. Más de normal* [C2B_P7]
1							
2							
3							
4							
5							

***Clave* 1**:
1. COMERCIO: Actividades donde se REVENDE cualquier producto. Es decir, que la persona que realiza la actividad no transforma el producto, sólo realiza actividades de compra o venta: pulpería, ferretería, abarrotes, venta de ropa, etc
2. SERVICIO: Actividades a través de las cuales se presta un servicio a la comunidad: servicios de reparación, transporte, belleza, costura, jardinería, lavado y planchado, etc
3. PROCESAMIENTO DE ALIMENTOS: Actividad donde la persona que la realiza transforman los alimentos: nacatamales, rosquillas, fritanga, comiderías, cuajada, queso, etc
4. PEQUEÑA INDUSTRIA: Actividad donde la persona que la realiza transforman los productos: cloro, jabón, bloques, ladrillos, verjas, etc
5. ARTESANIAS: Al igual que en la industria la persona que realiza la actividad transforma la materia prima, pero de forma manual y rústica: canastos, sombreros, hamaca, productos de madera, barro, etc
6. OTRAS ACTIVIDADES: Cualquier actividad que no pueda ser incluída en las anteriores categorías.

NOTA: Si tiene dudas de una actividad, ponga el nombre y luego la persona que codifique la encuesta le pondrá la clave correspondiente

2C. Transferencias Recibidas e Ingreso por Alquiler

2.3. ¿En los últimos 12 meses, algún miembro del hogar recibió alguno de los siguientes tipos de ingreso:

1. Pensión o jubilación
2. Asistencia del: gobierno, iglesia, u otro grupo
3. Herencia
4. Ingreso por alquiler de un predio ***no agrícola, cuarto, maquinaria u otro bien****?*

Sí……. 1 → ***REGISTRE LOS DATOS DE CADA TRANSFERENCIA O ALQUILER EN EL CUADRO 2C***
No…… 2 → ***PASE A LA PREGUNTA 2.4***

Cuadro 2C. Transferencias e Ingreso por Alquiler

1. No. de Orden [C2C_P1]	2. Tipo de Transferencia Clave 1 [C2C_P2]	3. ¿Quién la recibió? Código Personal [C2C_P3]	4. ¿Cuántas veces la recibió en los últimos 12 meses? [C2C_P4]	5. ¿Cuánto recibió cada vez? C$ (si recibió en comida o bienes, indique el valor aproximado) [C2C_P5]
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Clave 1

1.Pensión de jubilación
2.Pensión de discapacidad
3.Pensión de viudez
4.Pago de jubilado pagado por empleador privado
5.Compensación de trabajador lastimado
6.Donación de orfandad (<18)
7.Donación estatal para madre y niños
8. Asistencia de la iglesia
9. Asistencia de otro grupo
10.Pagos de intereses de valores u otros bienes
11.Dinero heredado
12,Comida suplementaria gubernamental
13.Asistencia a veteranos o por muerto en combate
14. Alquiler de predio o casa
15. Alquiler de maquinaria u otro bien
16.Otro (especifique):_____

2D. Remesas Y Contribuciones Recibidas por el Hogar

2.4. Hay familiares u otras personas que no son residentes del hogar quienes mandan dinero, comida o otro tipo de contribución a este hogar? (ES DECIR, RECIBIDO POR UN MIEMBRO RESIDENTE DEL HOGAR)
Sí……. 1 → ***REGISTRE LOS DATOS DE CADA REMITENTE EN EL CUADRO 2D***
No…… 2 → ***PASE A LA SECCION 3***

Cuadro 2D. Remesas Recibidas ***(NOTE: DINERO O PRESTAMOS DE BIENES QUE SE ESPERAN QUE SERAN REPAGADOS DEBERIAN DE INCLUIRSE EN SECCION 8, NO AQUI)***

1 No. de Orden [C2D_P1]	2. Nombre de la persona que *envía* dinero o productos [C2D_P2]	3. ¿Dónde se encuentra […] ahora? Clave 1 [C2D_P3]	4. ¿Quién en el hogar *recibió* la remesa? -Código personal -00 si a todos [C2D_P4]	5. ¿Qué relación tiene el remitente con el jefe del hogar? Clave 2 [C2D_P5]	En los últimos 12 meses: 6. ¿Cuántas veces recibieron envíos de esta persona? [C2D_P6]	¿Cuál fue el total recibido de esta persona *en efectivo*? 7. Monto [C2D_P7]	8. Moneda *1. C$ 2. USD$* [C2D_P7b]	¿Cuál fue el total recibido de esta persona *en comida o bienes*? *C$* 9. Monto [C2D_P8]	10. Moneda *1. C$ 2. USD$* [C2D_P8b]
1									
2									
3									
4									
5									

Clave 1

1 Managua
2 En el mismo departamento
3 Fuera de departamento
4 Costa Rica.
5 Otro País en América Central
6 México
7 USA
8. Canada
9.Otro País en América Latina
10 Europa
11 Otro continente

Clave 2

1. Jefe
2. Cónyuge
3. Hijo/a
4. Padre/madre
5. Abuelo/abuela
6. Hermano/a
7. Otro familiar
8. No familiar

SECCIÓN 3. TIERRA

PEDAZOS DE TIERRAS CON QUE CUENTA EL HOGAR

(UN PEDAZO DE TIERRA ES DEFINIDO COMO UNA TIERRA CONTIGUA QUE ESTÁ BAJO LA MISMA FORMA DE PROPIEDAD, GENERALMENTE CON EL MISMO MODO DE ADQUISICIÓN. MANERA, UNA FINCA PUEDE HABER SIDO CONFORMADA DE VARIOS PEDAZOS DE TIERRA QUE LA PERSONA FUE COMPRANDO, ALQUILA, OCUPA O TRABAJA A MEDIAS).

¿Me podría listar todos los pedazos de tierra PROPIOS u OCUPADO DE HECHO con que cuenta (sean estos alquilados, prestados o dados a media A otros)?

Cuadro 3A. Pedazos de Tierra Propios u Ocupados de Hecho

1. No de pedazo	**2. Nombre de cada pedazo**	**3. Area de cada pedazo**	**4. Distancia del hogar:** *1. Mts. 2. Km*		**5. Condición de tenencia que se encuentra este pedazo de tierra propio:** *1. Suyo por herencia 2. Suyo, comprado 3. Suyo, ocupado de hecho 4. Suyo por donación 5. Suyo, por reforma agraria 6. Suyo, por otro:_____*	**6. ¿En qué año adquirió este pedazo de tierra?**	**7. ¿Uso principal del pedazo durante el año agricola 2007?** *1. Alquidado a otro 2. recibido o a medias 3. prestado a otro 4. cultivos annuales 5. cultivos perennes 6. pastos 7. bosques 8. descanso 9. vivienda 10. otro*	**8. ¿Si Ud. alquilara este pedazo de tierra a otra persona, a qué precio podría alquilarlo?** *Codigo 1. por siembra 2. por año*		**9. ¿Si Ud. vendiera este pedazo de tierra, a qué precio podría venderlo?** *Codigo 1. C$ 2. USD$*	
		Mzs	*Distancia*	*Codigo*				*C$/mz*	*Codigo*	*Cantidad*	*Codigo*
[C3A_P1]	**[C3A_P2]**	**[C3A_P3]**	**[C3A_P4A]**	**[C3A_P4B]**	**[C3A_P5]**	**[C3A_P6]**	**[C3A_P7]**	**[C3A_P8]**	**[C3A_P8B]**	**[C3C_P9]**	**[C3C_P9B]**
1.											
2.											
3.											
4.											
5.											
6.											
7.											

¿Me podría listar todos los otros pedazos de tierra que NO son propios con que cuenta (ej., **recibidos** en alquiler o media, o prestados DE otros)?

Cuadro 3B. Pedazos de Tierra No- Propios con que Dispone el Hogar

1. No. de pedazo	2. Nombre de cada pedazo	3. Area de cada pedazo	4. Distancia del hogar: *1. Mts. 2. Km*	5. ¿Cuándo recibió este pedazo de tierra de la contraparte?		6. Condición de tenencia que se encuentra este pedazo de tierra: *1. Recibido en alquiler → PASE A 7 2. Recibido a media → PASE A 7 3. Recibido prestado 4. otro: especifique _____ 5. otro: especifique _____ 6. otro: especifique _____*	7. ¿Cuál fue la forma de pago acordada? *1. Monto Fijo → PASE A 8 2. % de Producto → PASE A 9*	MONTO FIJO… 8. ¿Cuánto pagó en total el año pasado? *(DESDE MARZO 2007)*	EN CASO DE % DE PRODUCTO… 9. ¿Con cuál producto/cultivo pagó? *(ANOTAR CODIGO DE CULTIVO PRINCIPAL, O 99 PARA GANADO)*	10. ¿Cuál fue el porcentaje de la cosecha/producto acordado?	11. ¿Cuál fue el valor total de los productos pagado por Ud. en el año passado?	12. ¿Cuál fue el porcentaje de costos de la producción en este pedazo asumidos por la contraparte?
		Mzs	*Dist.*	*Mes*	*Año*	*Codigo*	*Codigo*	*C$*	*Codigo*	*%*	*C$*	*%*
[C3B_P1]	**[C3B_P2]**	**[C3B_P3]**	**[C3B_P4A-B]**	**[C3B_P5A]**	**[C3B_P5B]**	**[C3B_P6], otro: [C3B_P6B]**	**[C3B_P7]**	**[C3B_P8]**	**[C3B_P9]**	**[C3B_P10]**	**[C3B_P11]**	**[C3B_P12]**
10.												
11.												
12.												
13.												
14.												
15.												

TIERRAS DADAS EN ALQUILER, A MEDIA O PRESTADAS DE OTROS EN EL ANO AGRICOLA DE 2007 (*DESDE MARZO 2007*)

3.1 Desde Marzo 2007 (Primera/07), ¿Ud. dió algun de sus pedazos de tierra en alquiler, a media o prestada temporalmente a otros?
[P3_1]
Sí…….. → ***PASE A PREGUNTA 3.2***
No……. → ***PASE A LA PREGUNTA 3.4***

3.2 ¿Cuál fue el valor total de la renta que usted recibio en el año 2007? [P3_2]
1. _____ *$C* → ***PASE A 3.3***
2. *lo dío a media* → ***PASE A 3.4***

3.3 ¿Lo recibió (la renta): [P3_3]
1. *en monto fijo, efectivo*
2. *en monto fijo, especie*
3. *en % de producto. Cual cultivo:* _____[P3_3B]
Cual por ciento: _____ [P3_3C]
4. *otro:* _____[P3_3D]

ADQUISICION DE TIERRAS PROPIAS U OCUPADAS DE HECHO

3.4 ¿Desde 1990 (cambio de gobierno), ¿Ud. ha comprado, ocupado de hecho, recibido en herencia, recibido en donación, vendido o transferido algún pedazo de tierra?

1. Sí → ***LLENE EL CUADRO 3G*** 2. No → ***PASE A SECCION 4***

Cuadro 3C. Adquisición de Tierras Propias o De Hecho y Transferencia de propiedad A OTROS desde 1990

Año	1. Cantidad de tierra propia en este año
1990	C3C_P_90
1991	C3C_P_91
1992	C3C_P_92
1993	C3C_P_93
1994	C3C_P_94
1995	C3C_P_95
1996	C3C_P_96
1997	C3C_P_97
1998	C3C_P_98
1999	C3C_P_99
2000	C3C_P_00
2001	C3C_P_01
2002	C3C_P_02
2003	C3C_P_03
2004	C3C_P_04
2005	C3C_P_05
2006	C3C_P_06
2007	C3C_P_07
2008	C3C_P_08

3D.

Año	Adquisición de Tierras						Transferencia de propiedad A OTROS (en ventas, herencias)			
	2. Area adquirida *Mzs*	**3. Tipo de adquisición** *1. Comprada → **PASE A 4*** *2. Herencia* *3. Donación/regalo* *4. Ocupo de hecho* *5.Otro:_____* **[C3D_P3B]**	**4. Valor total de la compra:** *Codigo* *1. C$* *2. USD$*		**5. ¿Sacó algún préstamo del banco o de otra institución financiera para comprar este pedazo de tierra?** *caso sí, ponga el monto.* *caso no, ponga 00*	**6. Area Transferida** *Mzs.*	**7. Tipo de transferencia** *1. Venta → **PASE A 8*** *2. Herencia* *3. Donación/regalo* *4. Ocupación de hecho* *5. Otro:_____* **[C3E_P3B]**	**8. Valor total de la venta:** *Codigo* *1. C$* *2. USD$*	
[C3D_P2] / [C3E_P2]	**[C3D__P1]**	**[C3D_P3]**	*Cantidad* **[C3D_P4]**	*Codigo* **_P4B]**	**[C3D_P5]**	**[C3E_P1]**	**[C3E_P3]**	*Cantidad* **[C3E_P4]**	*Codigo* **_P4B]**
1990									
1991									
1992									
1993									
1994									
1995									
1996									
1997									
1998									
1999									
2000									
2001									
2002									
2003									
2004									
2005									
2006									
2007									
2008									

SECCION 4. ACTIVIDAD AGRICOLA

Producción y Destino de Cultivos Anuales y Permanentes

Puede decir cuales cultivos sembró el año pasado (ciclo agícola 2007-2008)?
SI NO SEMBRO CULTIVOS, PASE A 4E

Cuadro 4A. Producción y Destino de Cultivos Anuales en el ciclo agícola 2007-2008.

PRIMERA (1) [CICLO]

1. Nombre de cultivo *Clave 1*	2. Area Sembrada *Mzs.*	3. Producción Total Obtenida *Cantidad*	4. U/M *Clave 2*	5. Año en que usted empezo a cultivar este cultivo en la temporada primera	6. Cantidad que vendio en 2007 *Cantidad*	7. U/M *Clave 2*	8. Precio *$C*	9. Total *$C*
[C4A_P1]	[C4A_P2]	[C4A_P3]	[C4A_P4]	[C4A_P5]	[C4A_P6]	[C4A_P7]	[C4A_P8]	[C4A_P9]

POSTRERA (2)

Nombre de cultivo *Clave 1*	Area Sembrada *Mzs*	Producción Total Obtenida *Cantidad*	U/M *Clave 2*	Año en que usted empezo a cultivar este cultivo en la temporada prostrera	Cantidad que vendio en 2007 *Cantidad*	U/M *Clave 2*	Precio *$C*	Total *$C*

APANTE (3)

Nombre de cultivo ***Clave 1***	Area Sembrada *Mzs*	Producción Total Obtenida *Cantidad*	U/M *Clave 2*	Año en que usted empezo a cultivar este cultivo en la temporada apante	Cantidad que vendio en 2007 *Cantidad*	U/M *Clave 2*	Precio *$C*	Total *$C*

Clave 1: Nombre de Cultivo

1. Maiz 2. Frijol 3. Arroz 4. Sorgo Industrial 5. Sorgo Millon 6. Sorgo Blanco 7. Sorgo Escobero 8. Ajonjoli 9. Maní 10. Soya 11. Café 12. Cacao 13. Yuca 14. Malanga 15. Quesquisque 16. Musaceas 17. Cebolla 18. Chiltoma 19. Zanahoria 20. Ayote 21. Papa 22. Jengibre 23. Chile 24. Tomate 25. Pipian 26. Ajo 27. Sandia 28. Otras Frutas 29. Pitahaya 30. Citricos 31. Repollo 32. Caña de azucar 33. Piña 34. Aguacate 35. Tempate 36. Tamarindo 37. Especias maderables 38. Otro, especifique

Clave 2: Unidad de Medida

1. QQ 2. Unidad 3. Canasta 4. Docenas 5. Miles 6. Vara 7. Medios de 14 Lbs. 8. Medio de 25 Lbs. 9. Caja de 25 Lbs. 10. Libras 11. Racimos 12. Sacos 13. Latas 14. Miles 15. Flete 16. QQ oro 17. QQ uva 18. QQ pergamino húmedo 19. QQ pergamino seco 20. Otro, especifique 21. Otro, especifique

4B. Costos de producción de PRIMERA, ciclo agícola de 2007-2008
→ ***SI TUVO COSTOS DE PRODUCCION DE PRIMERA, LLENE CUADROS 4B1 Y 4B2***
→ ***SI NO, PASE AL SECCION 4C***
"Me dijó Ud. que en la primera del 2007-2008, cultivó los sigueintes cultivos ….. . "
(EL ENCUESTADOR DEBE REFERIR A LOS CULTIVOS NOMBRADOS EN EL CUADRO 4A).
"Primero me gustaría preguntarle sobre todos los costos que tuvo Ud. relacionados a su cultivo de [….]. ¿Tuvo más de una parcela de […] en la primera?" En caso afirmativo: "**Prefiero preguntarle sobre cada parcela separado. Pero si Ud. prefiere, podemos hablar de todas las parcelas de […] a la vez. ¿Cómo hacemos?"**

4B1. Gastos que son para MAS DE UN CULTIVO en la PRIMERA – preparación del suelo, por ejemplo

1. Actividad	2. ¿Por Cuales Cultivos?	3. ¿Por cuantas mzas?	3. Tipo de costo	4. Cantidad	5. Precio Unitario	6. Costo Total
	Codigo de Cultivos *Clave 1* **[C4B_P1_1-P1_3]**	*mzas*	*1.Tractor. 2.Bueyes 3.Mano de Obra Temp. 4. Insumo 5. Otro* **[_P2B]** **[C4B_P2]**	*Numero de Unidades* **[C4B_P3]**	**[C4B_P4]**	*4 X 5=6* *C$* **[C4B_P5]**
¿Tuvó costos de maquinaria, mano de obra temporal para mas de un cultivo?				***hombres*** ***dias*** ***mzs***	***$C/mz***	
				_____X____X_____X_____=		
				_____X____X_____X_____=		
				_____X____X_____X_____=		
				_____X____X_____X_____=		
				_____X____X_____X_____=		
				_____X____X_____X_____=		
¿Tuvó costos de INSUMOS para mas de un cultivo?				***Cantidad/mza*** ***mzs***		
				_____X_____=		
				_____X_____=		
				_____X_____=		
				_____X_____=		
				_____X_____=		

<u>INSTRUCTIVO AL ENCUESTADOR</u>: SE DEBE SOLICTAR <u>TODOS</u> LOS COSTOS RELACIONADOS A CADA PARCELA/CULITVO ANTES DE PASAR A LA PROXIMA PARCELA/CULTIVO. DESPUES DE TERMINAR CON CADA CULTIVO, PASE AL PROXIMO CULTIVO REGISTRADO EN EL CUADRO 4A
Cuadro 4B2. Costos de Producción de PRIMERA [CICLO]

1. Actividad	2. Por Cultivo	3. Tipo de costo	4. Cantidad	5. Precio Unitario	6. Costo Total
	Cod de Cult. Clave 1 **[C4B_P1_1-P1_3]**	*1.Tractor. 4. Insumo 2.Bueyes 5. Otro 3.Mano de Obra Temp.* **[C4B_P2]**	*Numero de Unidades* **[C4B_P3]**	**[C4B_P4]**	*4 X 5=6 C$* **[C4B_P5]**
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de PRESIEMBRA por su cultivo de […]?					
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de *PREPARACION DEL SUELO Y SIEMBRA* ***por su cultivo de […]?***					
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de *COSECHA Y POST-COSECHA* ***por su cultivo de […]?***					
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		
			_____X_____=		

Clave 1: Nombre de Cultivos

1. Maiz	*6. Sorgo Blanco*	*11. Café*	*16. Musaceas*	*21. Papa.*	*26.Ajo*	*31. Repollo*	*36. Tamarindo*
2. Frijol	*7.Sorgo Escobero*	*12. Cacao*	*17. Cebolla*	*22. Gengibre*	*27. Sandia/Melon*	*32. Caña de Azuca*	*37 Especias maderables*
3. Arroz	*8. Ajonjolí*	*13. Yuca*	*18. Chiltoma*	*23. Chile.*	*28. Otras Frutas*	*33. Piña*	*38. Otro, esp:*
4. Sorgo Industrial	*9. Maní*	*14. Malanga*	*19. Zanahoria*	*24. Tomate.*	*29. Pitahaya 30. Cítricos*	*34. Aguacate*	
5. Sorgo Millon	*10. Soya*	*15.Quesquisque*	*20. Ayote*	*25. Pipian*		*35. Tempate*	

4C. Costos de producción de POSTRERA, ciclo agícola de 2007-2008

→ ***SI TUVO COSTOS DE PRODUCCION DE POSTRERA, LLENE CUADROS 4C1 Y 4C2***
→ ***SI NO, PASE AL SECCION 4D***

"Me dijó Ud. que en la Postrera del 2007-2008, cultivó los sigueintes cultivos ….. . "

(EL ENCUESTADOR DEBE REFERIR A LOS CULTIVOS NOMBRADOS EN EL CUADRO 4A).

"Primero me gustaría preguntarle sobre todos los costos que tuvo Ud. relacionados a su cultivo de [….]. ¿Tuvo más de una parcela de […] en la Postrera ?" En caso afirmativo: "**Prefiero preguntarle sobre cada parcela separado. Pero si Ud. prefiere, podemos hablar de todas las parcelas de […] a la vez. ¿Cómo hacemos?"**

4C1. Gastos que son para MAS DE UN CULTIVO en la POSTRERA – ***preparación del suelo, por ejemplo***

1. Actividad	2. ¿Por Cuales Cultivos?	3. ¿Por cuantas mzas?	3. Tipo de costo	4. Cantidad	5. Precio Unitario	6. Costo Total
	Codigo de Cultivos Clave 1	*mzas*	*1.Tractor. 4. Insumo 2.Bueyes 5. Otro 3.Mano de Obra Temp.*	*Numero de Unidades*		*4.X5.=6.* *C$*
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos que es para mas de un cultivo?						
				____X____=		
				____X____=		
				____X____=		
				____X____=		
				____X____=		

<u>INSTRUCTIVO AL ENCUESTADOR</u>: SE DEBE SOLICTAR <u>TODOS</u> LOS COSTOS RELACIONADOS A CADA PARCELA/CULITVO ANTES DE PASAR A LA PROXIMA PARCELA/CULTIVO. DESPUES DE TERMINAR CON CADA CULTIVO, PASE AL PROXIMO CULTIVO REGISTRADO EN EL CUADRO 4A

Cuadro 4C2. Costos de Producción de POSTRERA [CICLO]

1. Actividad	2. Por Cultivo	3. Tipo de costo	4. Cantidad	5. Precio Unitario	6. Costo Total
	Cod de Cult. Clave 1	*1.Tractor. 4. Insumo 2.Bueyes 5. Otro 3.Mano de Obra Temp.*	*Numero de Unidades*		*4.X5.=6.* *C$*
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de PRESIEMBRA por su cultivo de […]?					
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de *PREPARACION DEL SUELO Y SIEMBRA* ***por su cultivo de […]?***					
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de *COSECHA Y POST-COSECHA* ***por su cultivo de […]?***					
			____X____=		
			____X____=		
			____X____=		
			____X____=		
			____X____=		

Clave 1: Nombre de Cultivos

1. Maiz	*6. Sorgo Blanco*	*11. Café*	*16. Musaceas*	*21. Papa.*	*26.Ajo*	*31. Repollo*	*36. Tamarindo*
2. Frijol	*7.Sorgo Escobero*	*12. Cacao*	*17. Cebolla*	*22. Gengibre*	*27. Sandía/Melon*	*32. Caña de Azuca*	*37 Especias maderables*
3. Arroz	*8. Ajonjolí*	*13. Yuca*	*18. Chiltoma*	*23. Chile.*	*28. Otras Frutas*	*33. Piña*	*38. Otro, esp:*
4. Sorgo Industrial	*9. Maní*	*14. Malanga*	*19. Zanahoria*	*24. Tomate.*	*29. Pitahaya*	*34. Aguacate*	
5. Sorgo Millon	*10. Soya*	*15.Quesquisque*	*20. Ayote*	*25. Pipian*	*30. Cítricos*	*35. Tempate*	

4D. Costos de producción de APANTE, ciclo agícola de 2007-2008

➔ ***SI TUVO COSTOS DE PRODUCCION DE APANTE , LLENE CUADROS 4D1 Y 4D2***
➔ ***SI NO, PASE AL SECCION 4E***

"Me dijó Ud. que en la Apante del 2007-2008, cultivó los sigueintes cultivos ….. . "

(EL ENCUESTADOR DEBE REFERIR A LOS CULTIVOS NOMBRADOS EN EL CUADRO 4A).

"Primero me gustaría preguntarle sobre todos los costos que tuvo Ud. relacionados a su cultivo de [….]. ¿Tuvo más de una parcela de […] en la Apante ?" En caso afirmativo*:* "**Prefiero preguntarle sobre cada parcela separado. Pero si Ud. prefiere, podemos hablar de todas las parcelas de […] a la vez. ¿Cómo hacemos?"**

4D1. Gastos que son para MAS DE UN CULTIVO en la APANTE ***– preparación del suelo, por ejemplo***

1. Actividad	2. ¿Por Cuales Cultivos?	3. ¿Por cuantas mzas?	3. Tipo de costo	4. Cantidad	5. Precio Unitario	6. Costo Total
	Codigo de Cultivos Clave 1	*mzas*	*1.Tractor. 4. Insumo 2.Bueyes 5. Otro 3.Mano de Obra Temp.*	*Numero de Unidades*		*4.X5.=6.* *C$*
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos que es para mas de un cultivo?						
				_____ X _____		=
				_____ X _____		=
				_____ X _____		=
				_____ X _____		=
				_____ X _____		=

INSTRUCTIVO AL ENCUESTADOR: SE DEBE SOLICTAR TODOS LOS COSTOS RELACIONADOS A CADA PARCELA/CULITVO ANTES DE PASAR A LA PROXIMA PARCELA/CULTIVO. DESPUES DE TERMINAR CON CADA CULTIVO, PASE AL PROXIMO CULTIVO REGISTRADO EN EL CUADRO 4A

Cuadro 4D2. Costos de Producción de APANTE [CICLO]

1. Actividad	2. Por Cultivo	3. Tipo de costo	4. Cantidad	5. Precio Unitario	6. Costo Total
	Cod de Cult. Clave 1	*1.Tractor. 4. Insumo 2.Bueyes 5. Otro 3.Mano de Obra Temp.*	*Numero de Unidades*		*4.X5.=6.* *C$*
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de PRESIEMBRA por su cultivo de […]?					
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de *PREPARACION DEL SUELO Y SIEMBRA* ***por su cultivo de […]?***					
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de *COSECHA Y POST-COSECHA* ***por su cultivo de […]?***					
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=
			_____ X _____		=

Clave 1: Nombre de Cultivos

1. Maiz	*6. Sorgo Blanco*	*11. Café*	*16. Musaceas*	*21. Papa.*	*26.Ajo*	*31. Repollo*	*36. Tamarindo*
2. Frijol	*7.Sorgo Escobero*	*12. Cacao*	*17. Cebolla*	*22. Gengibre*	*27. Sandia/Melon*	*32. Caña de Azuca*	*37 Especias maderables*
3. Arroz	*8. Ajonjolí*	*13. Yuca*	*18. Chiltoma*	*23. Chile.*	*28. Otras Frutas*	*33. Piña*	*38. Otro, esp:*
4. Sorgo Industrial	*9. Maní*	*14. Malanga*	*19. Zanahoria*	*24. Tomate.*	*29. Pitahaya 30. Cítricos*	*34. Aguacate*	
5. Sorgo Millon	*10. Soya*	*15.Quesquisque*	*20. Ayote*	*25. Pipian*		*35. Tempate*	

4E. Costos de producción de CULTIVOS PERMANENTES ciclo agícola de 2007-2008

¿Puede contarnos sobre los cultivos permanentes y semipermanentes que tiene?
-SI NO TIENE CULTIVOS PERMANENTES, PASE A LA CUADRA 4F.

Cuadro 4E1. Producción y Destino de Cultivos Anuales en el ciclo agícola 2007-2008.

1. Clave de cultivo *Clave 1*	2. Area Sembrada *Mzs*	3. Producción Total Obtenida *cantidad*	4. U/M	5. Cantidad que vendio	6. U/M	7. Precio *C$*	8. Total *C$*	9. ¿En total, cuántos arboles tiene?
[C4G1_P1]	[C4G1_P2] .	[C4G1_P3] .	[C4G1_P4]	[C4G1_P5]	[C4G1_P6]	[C4G1_P7]	[C4G1_P8]	[C4G1_P9]
	.	.						
	.	.						
	.	.						
	.	.						
	.	.						
	.	.						

→ SI TUVO COSTOS DE PRODUCCION CULTIVOS PERMANENTES, LLENE EL CUADRO 4G
→ SI NO, PASE AL CUADRO 4H
→ EL ENCUESTADOR DEBE REFERIR A LOS CULTIVOS NOMBRADOS EN EL CUADRO 4G.1

"Primero me gustaría preguntarle sobre todos los costos que tuvo Ud. relacionados a su cultivo de [….]. ¿Tuvo más de una parcela de […] en la primera?" En caso afirmativo*:* "**Prefiero preguntarle sobre cada parcela separado. Pero si Ud. prefiere, podemos hablar de todas las parcelas de […] a la vez. ¿Cómo hacemos?"**

<u>INSTRUCTIVO AL ENCUESTADOR</u>: SE DEBE SOLICTAR <u>TODOS</u> LOS COSTOS RELACIONADOS A CADA PARCELA/CULITVO ANTES DE PASAR A LA PROXIMA PARCELA/CULTIVO. DESPUES DE TERMINAR CON CADA CULTIVO, PASE AL PROXIMO CULTIVO REGISTRADO EN EL CUADRO 4A

Cuadro 4E2 Costos de Producción de CULTIVOS PERMANENTES

Actividad	1. ¿Pedazo en que se encuentra el cultivo/la parcela? *Número de pedazo del Cuadro 3A o 3B 99=pedazos multiples*	2. Cultivo *Cod de Cult. Clave 1* *99=Cultivos multiples*	3. Tipo de costo *1.Tractor. 2.Bueyes 3.Mano de Obra Temp. 4. Insumo 5. Otro*	4. Cantidad *Numero de Unidades*	5. Precio Unitario	6. Costo Total *4.X5.=6.* *C$*
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de VIVERO/SEMILLERO/INSTALACION por su cultivo de […]?						
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
¿Tuvó costos de maquinaria, mano de obra temporal, o insumos en los labores de COSECHA Y POST-COSECHA por su cultivo de […]?						
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		
				_____ X _____		

Clave 1: *Nombre de Cultivos*

1. Maiz	*6. Sorgo Blanco*	*11. Café*	*16. Musaceas*	*21. Papa.*	*26.Ajo*	*31. Repollo*	*36. Tamarindo*
2. Frijol	*7.Sorgo Escobero*	*12. Cacao*	*17. Cebolla*	*22. Gengibre*	*27. Sandía/Melon*	*32. Caña de Azuca*	*37 Especias maderables*
3. Arroz	*8. Ajonjolí*	*13. Yuca*	*18. Chiltoma*	*23. Chile.*	*28. Otras Frutas*	*33. Piña*	*38. Otro, esp:*
4. Sorgo Industrial	*9. Maní*	*14. Malanga*	*19. Zanahoria*	*24. Tomate.*	*29. Pitahaya 30. Cítricos*	*34. Aguacate*	
5. Sorgo Millon	*10. Soya*	*15.Quesquisque*	*20. Ayote*	*25. Pipian*		*35. Tempate*	

4F. Utilización y costo de insumos claves.
→ SI EL ENTREVISTADO UTILIZÓ SEMILLA MEJORADA, SEMILLA CERTIFICADA, UREA O FERTILIZANTE "COMPLETO" EN SU PRODUCCION, LLENE EL CUADRO 4F)
→ SI NO, PASE A LA PREGUNTA 4.2

Cuadro 4F. Utilización y Costo de Insumos Claves

Tipo de insumo **[TIPO]**	**1.** **Nombre de cultivo** *Clave 1* **[C4F_P1]**	**2.** **Cantidad Comprada** **#** **[C4F_P2]**	**3.** **Unidad de Medida** *1. QQ* *2.Libra* *3. Kilo* **[C4F_P3]**	**4.** **Precio Unitario** *C$* **[C4F_P4]**
1. Semilla mejorada 1				
2. Semilla mejorada 2				
3. Semilla certificada 1				
4. Semilla certificada 2				
5. Urea				
6. Completo				

Clave 1: Nombre de Cultivo
1. Maiz 2. Frijol 3. Arroz 4. Sorgo Industrial 5. Sorgo Millon 6. Sorgo Blanco 7.Sorgo Escobero 8. Ajonjolí 9. Maní 10. Soya 11. Café 12. Cacao 13. Yuca 14. Malanga 15. Quesquisque 16. Musaceas 17. Cebolla 18. Chiltoma 19. Zanahoria 20. Ayote 21. Papa. 22. Gengibre…23. Chile. 24. Tomate. 25. Pipian 26.Ajo 27. Sandia/Melon 28. Otras Frutas 29. Pitahaya 30. Cítricos 31. Repollo 32. Caña de Azuca 33. Piña 34. Aguacate 35. Tempate 36. Tamarindo 37 Especias maderables
38. Otro, esp: **[C4H_P1B]**

Gastos de Mantenimiento de Equipo Agícola
4.2.¿Ud. tuvo gastos de mantenimiento de equipo o pagó/alquiló agua en el ciclo agícola de Marzo**2007-**Marzo**2008**?
__[P4_2]__
SI→***LLENE EL CUADRO 4G*** NO →***PASE A 4.3***

Cuadro 4G. Gastos en Mantenimiento de Equipo Agrícola y Agua de Riego

1. **Tipo de Gasto**		**2. Costo total en 2007-2008** *C$*
Combustible y lubricantes	**[C4G_P1]**	
Electricidad	**[C4G_P2]**	
Reparación significativa de equipo	**[C4G_P3]**	
Agua de riego	**[C4G_P4]**	
Otros	**[C4G_P5]**	

4.3. ¿De todos estos insumos y costos ya mencionados, aproximadamente que parte recibió a crédito? **__[P4_3]__**
1. Más de la mitad 2. La mitad 3. Menos de la mitad 4. Muy poco 5. Nada

4.4 ¿Ud. utilizó asistencia técnica profesional en 2007? **__[P4_4] __**
SI→ ***LLENE EL CUADRO 4.H*** NO→ ***PASE A LA PREGUNTA 4.5***

Cuadro 4H. Naturaleza de la Asistencia Técnica

¿De qué se trató la asistencia técnica? *TIPO DE SERVICIO*	1. ¿Recibió Asistencia Técnica en este concepto? *1. Si 2. No*	2. ¿Cuánto pagó por Asistencia Técnica? *C$*	3. Quién la proporcionó *Clave 1*	*Clave 1:* *1. Gobierno* *2. ONG/Proyecto* *3. Privado* *4.Asociación de productores* *5.Otro_____*
1. Conservación del suelo	**[C4H_P1A]**	**[C4H_P1B]**	**[C4H_P1C]**	
2. Selección y mejoramiento de semilla	**[C4H_P2A]**	**[C4H_P2B]**	**[C4H_P2C]**	
3. Selección y mejoramiento de ganado	**[C4H_P3A]**	**[C4H_P3B]**	**[C4H_P3C]**	
4. Manejo de la post-cosecha	**[C4H_P4A]**	**[C4H_P4B]**	**[C4H_P4C]**	
5. Abono orgánico	**[C4H_P5A]**	**[C4H_P5B]**	**[C4H_P5C]**	
6. Introducción nevos cultivos	**[C4H_P6A]**	**[C4H_P6B]**	**[C4H_P6C]**	
7. Nuevo paquete técnico	**[C4H_P7A]**	**[C4H_P7B]**	**[C4H_P7C]**	
8. Reforestación	**[C4H_P8A]**	**[C4H_P8B]**	**[C4H_P8C]**	
9. Control de plagas y enfermedades	**[C4H_P9A]**	**[C4H_P9B]**	**[C4H_P9C]**	
10. Sanidad animal	**[C4H_P10A]**	**[C4H_P10B]**	**[C4H_P10C]**	
11. Otro (especifique)	**[C4H_P11A]**	**[C4H_P11B]**	**[C4H_P11C]**	

SALTE HASTA LA PREGUNTA 4.6

4.5 Porque, no recibió asistencia técnica? **___ [P4_5]** _____
1. *No la necesita*
2. *Cuesta demasiado*
3. *No tiene tiempo*
4. *No se ofrece*
5. *Calidad de la asistencia no es buena*
6. *Otra razon (especifique)*_____ **[P4_5B]** _____

4.6 ¿Va a sembrar frijol este año? [P4_6]
SI→ ***PASE A PREGUNTA 4.7*** NO → ***PASE A SECCION 5***

4.7 ¿Cuántas manzanas de frijol va a sembrar…
a. en la Primera**? [P4_7A]**
1. NINGUN *2.* _____ *mzs*
b. en la Prostrera? **[P4_7B]**
1. NINGUN *2.* _____ *mzs*
c. en el Apante? **[P4_7C]**
1. NINGUN *2.* _____ *mzs*

5.1. Desde el año 2006, cuáles productos agrícolas ha vendido usted? → ***LLENE CUADRO 5A.***

Cuadro 5A. Productos comercializados desde 2006

	1. Producto *Codigo*	**2.→ POR CADA ANO, INDICA TODOS LOS MERCADOS QUE USO PARA COMERCIALIZAR EL PRODUCTO:** *0. en plantillo 1.comprador en finca 2. mercado regional 3. mercado de Managua 4. exportador o procesador 5. Supermercado 6. Otro_____* **[C5A_P06b/_07b/_08b]**			**3. Año que empezó a cultivar este producto**	**4. Indique con 1, 2 y 3 los tres productos que le han generado más ingresos en los últimos 5 años.**
		2b. 2006	2c. 2007	2d. 2008		
	[C5A_P1]	**[C5A_P06_1-_P06_4]**	**[C5A_P07_1-_P07_4]**	**[C5A_P08_1-_P08_4]**	**[C5A_P5]**	**[C5A_P6]**
a.						
b.						
c.						
d.						
e.						
f.						

5B. <u>EN FINCA</u> ***SI DESDE 2006 EL PRODUCTOR HA VENDIDO ALGÚN PRODUCTO AGRÍCOLA ALGUNA VEZ EN FINCA → LLENE CUADROS 5B.1-3 CON LOS TRES PRODUCTOS QUE HA VENDIDO EN FINCA EN CANTIDADES MAS GRANDES.*** **[P5_1]**

NO → PASE A 5C.

Cuadro 5B.1 Comercialización en la finca: Producto B.1

1. Producto que ha vendido en finca **(PRODUCTO B.1)** **[C5B1_P1]**										
2. Nombres de los compradores que han comprado regularmente (producto B.1) en la finca en los últimos dos años (2006) → ***SI NO CONOCE LOS NOMBRES, NO IMPORTA, USE NUMEROS →SOLO INTERMEDIARIOS. EMPRESAS QUE HAN COMPRADO EN LA FINCA VAN EN 5E, 5F.*** **[C5B1_P2]**	3. ¿Hace cuántos años usted vende a este comprador? **[C5B1_P3]**	4. **Veces por año** que ha vendido a este comprador desde 2006. **[C5B1_P4a-b]** 2006	2007	5. Este comprador… → ***MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → PASE A 7* *2. le paga luego de cierto tiempo* *3. le ha dado crédito a usted* *4. le ha dado insumos para producir* **[C5B1_P5a-d]**	6. ¿ Cuántos días tarda en pagarle (a usted)? **[C5B1_P6]**	7. ¿Desde que empezó a vender a el, cuántas veces ha fallado en pagarle a usted? **[C5B1_P7]**	8. ¿Donde vende este comprador? *1. a un mayorista* *2. a consumidores* *3. a supermercados* *4. no sé* *5. otro* **[C5B1_P8]**	9. ¿Si entrega usted 10 cajas de (producto B.1) a este comprador, cuántas de esas 10 cajas le rechaza? **[C5B1_P9]**	10. ¿Tiene un precio diferenciando por calidades de producto? → ***MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño* *2. si, por condición* *3. si, otro* **[C51B_P10E]** *4. no* **[C5B1_P10a-d]**	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? → ***MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño* *2. lo selecciona por calidad* *3. lo selecciona por daño* *4. lo limpia* *5. no* **[C5B1_P11a-e]**
a.				1 2 3 4					1 2 3 4	1 2 3 4 5
b.				1 2 3 4					1 2 3 4	1 2 3 4 5
c.				1 2 3 4					1 2 3 4	1 2 3 4 5

Cuadro 5B.2. Comercialización en la finca: Producto B.2

1. Producto que ha vendido en finca (**PRODUCTO B.2**) **[C5B2_P1]**										
2. Nombres de los compradores que han comprado regularmente (producto B.2) en la finca en los últimos dos años (2006) → ***SI NO CONOCE LOS NOMBRES, NO IMPORTA, USE NUMEROS →SOLO INTERMEDIARIOS. EMPRESAS QUE HAN COMPRADO EN LA FINCA VAN EN 5E, 5F.***	3. ¿Hace cuántos años usted vende a este comprador?	4. **Veces por año** que ha vendido a este comprador desde 2006. 4a. 2006	4b. 2007	5. Este comprador… → ***MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → **PASE A 7** 2. le paga luego de cierto tiempo 3. le ha dado crédito a usted 4. le ha dado insumos para producir*	6. ¿ Cuántos días tarda en pagarle (a usted)?	7. ¿Desde que empezó a vender a el, cuántas veces ha fallado en pagarle a usted?	8. ¿Donde vende este comprador? *1. a un mayorista 2. a consumidores 3. a supermercados 4. no sé 5. otro*	9. ¿Si entrega usted 10 cajas de (producto B.2) a este comprador, cuántas de esas 10 cajas le rechaza?	10. ¿Tiene un precio diferenciando por calidades de producto? → ***MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño 2. si, por condición 3. si, otro _____ 4. no*	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? → ***MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño 2. lo selecciona por calidad 3. lo selecciona por daño 4. lo limpia 5. no*
a.				1 2 3 4					1 2 3 4	1 2 3 4 5
b.				1 2 3 4					1 2 3 4	1 2 3 4 5
c.				1 2 3 4					1 2 3 4	1 2 3 4 5

Cuadro 5B.3 Comercialización en la finca: Producto B.3

1. Producto que ha vendido en finca (**PRODUCTO B.3**) **[C5B3_P1]**										
2. Nombres de los compradores que han comprado regularmente (producto B.3) en la finca en los últimos dos años (2006) → ***SI NO CONOCE LOS NOMBRES, NO IMPORTA, USE NUMEROS →SOLO INTERMEDIARIOS. EMPRESAS QUE HAN COMPRADO EN LA FINCA VAN EN 5E, 5F.***	3. ¿Hace cuántos años usted vende a este comprador?	4. **Veces por año** que ha vendido a este comprador desde 2006. 4a. 2006	4b. 2007	5. Este comprador… → ***MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → **PASE A 7** 2. le paga luego de cierto tiempo 3. le ha dado crédito a usted 4. le ha dado insumos para producir*	6. ¿ Cuántos días tarda en pagarle (a usted)?	7. ¿Desde que empezó a vender a el, cuántas veces ha fallado en pagarle a usted?	8. ¿Donde vende este comprador? *1. a un mayorista 2. a consumidores 3. a supermercados 4. no sé 5. otro*	9. ¿Si entrega usted 10 cajas de (producto B.3) a este comprador, cuántas de esas 10 cajas le rechaza?	10. ¿Tiene un precio diferenciando por calidades de producto? → ***MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño 2. si, por condición 3. si, otro _____ 4. no*	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? → ***MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño 2. lo selecciona por calidad 3. lo selecciona por daño 4. lo limpia 5. no*
a.				1 2 3 4					1 2 3 4	1 2 3 4 5
b.				1 2 3 4					1 2 3 4	1 2 3 4 5
c.				1 2 3 4					1 2 3 4	1 2 3 4 5

5C. MERCADOS REGIONALES ***SI DESDE 2006 EL PRODUCTOR HA VENDIDO ALGÚN PRODUCTO AGRÍCOLA ALGUNA VEZ EN EL MERCADO REGIONAL → LLENE CUADROS 5C.1-3 CON LOS TRES PRODUCTOS QUE HA VENDIDO EN EL MERCADO REGIONAL EN CANTIDADES MAS GRANDES.***
NO → PASE A 5D.

Cuadro 5C.1 Comercialización en el mercado regional: Producto C.1 → ***USA LOS TRES COMPRADORES MAS FREQUENTES.***

1. Producto que ha vendido en el mercado regional **(PRODUCTO C.1) [C5C1_P1]**					2. Cuál mercado regional? **[C5C1_P2]** *1. Jinotega 2. Esteli 3. Matagalpa 4. Sébaco 5. León 6. Chinandega 7. Granada 8. Masaya 9. Otro* **[C5C1_P2a]**						
3. Compradores que han comprado regularmente (producto C.1) en el mercado regional en los últimos dos años (2006) → ***SI DICE QUE TODOS SON IGUALES, USA "RESPUESTA GENERAL", d*** **[C5C1_P3]**	4. ¿Hace cuántos años usted vende a este comprador/en este mercado? **[C5C1_P4]**	5. Veces **por año** que ha vendido a este comprador/ en este mercado desde 2006 **[C5C1_P5a-b]**		6. Este comprador /en este mercado… → ***MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → PASE A 8 2. le paga luego de cierto tiempo 3. le ha dado crédito a usted 4. le ha dado insumos para producir* **[C5C1_P6a-d]**	7. ¿ Cuántos días tarda en pagarle (a usted)? **[C5C1_P7]**	8. ¿Desde que empezó a vender a el/en este mercado, cuántas veces ha fallado en pagarle a usted? **[C5C1_P8]**	9. ¿Si entrega usted 10 cajas de (producto C.1) a este comprador/este mercado, cuántas de esas 10 cajas le rechaza? **[C5C1_P9]**	10. ¿Tiene un precio diferenciando por calidades de producto? → ***MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño 2. si, por condición 3. si, otro ____* **[C5C1_P10c]** *4. no* **[C5C1_P10a-d]**	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? → ***MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño 2. lo selecciona por calidad 3. lo selecciona por daño 4. lo limpia 5. no* **[C5C1_P11a-d]**	12. ¿Cuánto pagó en total para llevarla y transportarla (por U/M – por canasta, por ejemplo, o caja)? **[C5C1_P12a-b]**	
		2006	2006							$C	U/M
a.				1 2 3 4				1 2 3 4	1 2 3 4 5		
b.				1 2 3 4				1 2 3 4	1 2 3 4 5		
c.				1 2 3 4				1 2 3 4	1 2 3 4 5		
d. ***RESPUESTA GENERAL*** **[C5C1_P3a]**				1 2 3 4				1 2 3 4	1 2 3 4 5		

Cuadro 5C.2 Comercialización en el mercado regional: Producto C.2 → ***USA LOS TRES COMPRADORES MAS FREQUENTES.***

1. Producto que ha vendido en el mercado regional **(PRODUCTO C.2)**					2. Cuál mercado regional? *1. Jinotega 2. Esteli 3. Matagalpa 4. Sébaco 5. León 6. Chinandega 7. Granada 8. Masaya 9. otro*						
3. Compradores que han comprado regularmente (producto C.2) en el mercado regional en los últimos dos años (2006) → ***SI DICE QUE TODOS SON IGUALES, USA "RESPUESTA GENERAL", d***	4. ¿Hace cuántos años usted vende a este comprador/en este mercado?	5. Veces **por año** que ha vendido a este comprador/ en este mercado desde 2006		6. Este comprador /en este mercado… → ***MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → PASE A 8 2. le paga luego de cierto tiempo 3. le ha dado crédito a usted 4. le ha dado insumos para producir*	7. ¿ Cuántos días tarda en pagarle (a usted)?	8. ¿Desde que empezó a vender a el/en este mercado, cuántas veces ha fallado en pagarle a usted?	9. ¿Si entrega usted 10 cajas de (producto C.2) a este comprador/este mercado, cuántas de esas 10 cajas le rechaza?	10. ¿Tiene un precio diferenciando por calidades de producto? → ***MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño 2. si, por condición 3. si, otro _____ 4. no*	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? → ***MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño 2. lo selecciona por calidad 3. lo selecciona por daño 4. lo limpia 5. no*	12. ¿Cuánto pagó en total para llevarla y transportarla (por U/M – por canasta, por ejemplo, o caja)?	
		4a. 2006	4b. 2006							$C	U/M
a.				1 2 3 4				1 2 3 4	1 2 3 4 5		
b.				1 2 3 4				1 2 3 4	1 2 3 4 5		
c.				1 2 3 4				1 2 3 4	1 2 3 4 5		
d. ***RESPUESTA GENERAL***				1 2 3 4				1 2 3 4	1 2 3 4 5		

Cuadro 5C.3 Comercialización en el mercado regional: Producto C.3 → *USA LOS TRES COMPRADORES MAS FREQUENTES.*

1. Producto que ha vendido en el mercado regional **(PRODUCTO C.3)**					2. Cuál mercado regional? **[C5C3_P2]** *1. Jinotega 2. Esteli 3. Matagalpa 4. Sébaco 5. León 6. Chinandega 7. Granada 8. Masaya 9. otro*							
3. Compradores que han comprado regularmente (producto C.3) en el mercado regional en los últimos dos años (2006) ***→ SI DICE QUE TODOS SON IGUALES, USA "RESPUESTA GENERAL", d***	4. ¿Hace cuántos años usted vende a este comprador/en este mercado?	5. Veces **por año** que ha vendido a este comprador/ en este mercado desde 2006 4a. 2006	4b. 2006	6. Este comprador /en este mercado… → ***MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → **PASE A 8*** *2. le paga luego de cierto tiempo* *3. le ha dado crédito a usted* *4. le ha dado insumos para producir*	7. ¿ Cuántos días tarda en pagarle (a usted)?	8. ¿Desde que empezó a vender a el/en este mercado, cuántas veces ha fallado en pagarle a usted?	9. ¿Si entrega usted 10 cajas de (producto C.3) a este comprador/este mercado, cuántas de esas 10 cajas le rechaza?	10. ¿Tiene un precio diferenciando por calidades de producto? ***→ MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño* *2. si, por condición* *3. si, otro _____* *4. no*	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? ***→ MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño* *2. lo selecciona por calidad* *3. lo selecciona por daño* *4. lo limpia* *5. no*	12. ¿Cuánto pagó en total para llevarla y transportarla (por U/M – por canasta, por ejemplo, o caja)? *$C*	U/M
a.				1 2 3 4				1 2 3 4	1 2 3 4 5		
b.				1 2 3 4				1 2 3 4	1 2 3 4 5		
c.				1 2 3 4				1 2 3 4	1 2 3 4 5		
d. ***RESPUESTA GENERAL***				1 2 3 4				1 2 3 4	1 2 3 4 5		

5D. MERCADOS DE MANAGUA ***SI DESDE 2006 EL PRODUCTOR HA VENDIDO ALGÚN PRODUCTO AGRÍCOLA ALGUNA VEZ EN UN MERCADO DE MANAGUA → LLENE CUADROS 5D.1-3 CON LOS TRES PRODUCTOS QUE HA VENDIDO EN MANAGUA EN CANTIDADES MAS GRANDES.***
NO → PASE A 5E

Cuadro 5D.1 Comercialización en Managua: Producto D.1 → ***USA LOS TRES COMPRADORES MAS FREQUENTES.***

1. Producto que ha vendido en el mercado regional (**PRODUCTO D.1**) **[C5D1_P1]**					2. Cuál mercado regional? **[C5D1_P2]** *1. Jinotega 2. Esteli 3. Matagalpa 4. Sébaco 5. León 6. Chinandega 7. Granada 8. Masaya 9. otro*							
3. Compradores que han comprado regularmente (producto D.1) en el mercado regional en los últimos dos años (2006) → ***SI DICE QUE TODOS SON IGUALES, USA "RESPUESTA GENERAL", d*** **[C5D1_P3]**	4. ¿Hace cuántos años usted vende a este comprador/en este mercado? **[C5D1_P4]**	5. Veces **por año** que ha vendido a este comprador/ en este mercado desde 2006 **[C5D1_P5a-b]**		6. Este comprador /en este mercado… → ***MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → PASE A 8 2. le paga luego de cierto tiempo 3. le ha dado crédito a usted 4. le ha dado insumos para producir* **[C5D3_P6a-d]**	7. ¿ Cuántos días tarda en pagarle (a usted)? **[C5D1_P7]**	8. ¿Desde que empezó a vender a el/en este mercado, cuántas veces ha fallado en pagarle a usted? **[C5D1_P8]**	9. ¿Si entrega usted 10 cajas de (producto D.1) a este comprador/este mercado, cuántas de esas 10 cajas le rechaza? **[C5D1_P9]**	10. ¿Tiene un precio diferenciando por calidades de producto? → ***MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño 2. si, por condición 3. si, otro _____* **[C5D1_P10c]** *4. no* **[C5D1_P10a-d]**	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? → ***MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño 2. lo selecciona por calidad 3. lo selecciona por daño 4. lo limpia 5. no* **[C5D1_11ª-e]**	12. ¿Cuánto pagó en total para llevarla y transportarla (por U/M – por canasta, por ejemplo, o caja)? **[C5D1_P12a-b]**	
		4a. 2006	4b. 2006							*$C*	U/M
a.				1 2 3 4				1 2 3 4	1 2 3 4 5		
b.				1 2 3 4				1 2 3 4	1 2 3 4 5		
c.				1 2 3 4				1 2 3 4	1 2 3 4 5		
d. ***RESPUESTA GENERAL*** **[C5D1_P3a]**				1 2 3 4				1 2 3 4	1 2 3 4 5		

Cuadro 5D.2 Comercialización en Managua: Producto D.2 → *USA LOS TRES COMPRADORES MAS FREQUENTES.*

1. Producto que ha vendido en el mercado regional (**PRODUCTO D.1)**					2. Cuál mercado regional? *1. Jinotega 2. Estelí 3. Matagalpa 4. Sébaco 5. León 6. Chinandega* *7. Granada 8. Masaya 9. otro*							
3. Compradores que han comprado regularmente (producto D.2) en el mercado regional en los últimos dos años (2006) ***→ SI DICE QUE TODOS SON IGUALES, USA "RESPUESTA GENERAL", d***	4. ¿Hace cuántos años usted vende a este comprador/en este mercado?	5. Veces **por año** que ha vendido a este comprador/ en este mercado desde 2006 4a. 2006	4b. 2006	6. Este comprador /en este mercado… ***→ MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → **PASE A 8*** *2. le paga luego de cierto tiempo* *3. le ha dado crédito a usted* *4. le ha dado insumos para producir*	7. ¿ Cuántos días tarda en pagarle (a usted)?	8. ¿Desde que empezó a vender a el/en este mercado, cuántas veces ha fallado en pagarle a usted?	9. ¿Si entrega usted 10 cajas de (producto D.2) a este comprador/este mercado, cuántas de esas 10 cajas le rechaza?	10. ¿Tiene un precio diferenciando por calidades de producto? ***→ MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño* *2. si, por condición* *3. si, otro _____* *4. no*	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? ***→ MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño* *2. lo selecciona por calidad* *3. lo selecciona por daño* *4. lo limpia* *5. no*	12. ¿Cuánto pagó en total para llevarla y transportarla (por U/M – por canasta, por ejemplo, o caja)? *$C*	U/M
a.				1 2 3 4				1 2 3 4	1 2 3 4 5		
b.				1 2 3 4				1 2 3 4	1 2 3 4 5		
c.				1 2 3 4				1 2 3 4	1 2 3 4 5		
d. ***RESPUESTA GENERAL***				1 2 3 4				1 2 3 4	1 2 3 4 5		

Cuadro 5D.3 Comercialización en Managua: Producto D.3 → *USA LOS TRES COMPRADORES MAS FREQUENTES.*

1. Producto que ha vendido en el mercado regional (**PRODUCTO D.1**)					2. Cuál mercado regional? *1. Jinotega 2. Esteli 3. Matagalpa 4. Sébaco 5. León 6. Chinandega 7. Granada 8. Masaya 9. otro*								
3. Compradores que han comprado regularmente (producto D.3) en el mercado regional en los últimos dos años (2006) ***→ SI DICE QUE TODOS SON IGUALES, USA "RESPUESTA GENERAL", d***	4. ¿Hace cuántos años usted vende a este comprador/en este mercado?	5. Veces **por año** que ha vendido a este comprador/ en este mercado desde 2006		6. Este comprador /en este mercado… ***→ MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → **PASE A 8*** *2. le paga luego de cierto tiempo* *3. le ha dado crédito a usted* *4. le ha dado insumos para producir*	7. ¿ Cuántos días tarda en pagarle (a usted)?	8. ¿Desde que empezó a vender a el/en este mercado, cuántas veces ha fallado en pagarle a usted?	9. ¿Si entrega usted 10 cajas de (producto D.3) a este comprador/este mercado, cuántas de esas 10 cajas le rechaza?	10. ¿Tiene un precio diferenciando por calidades de producto? ***→ MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño* *2. si, por condición* *3. si, otro _____* *4. no*	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? ***→ MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño* *2. lo selecciona por calidad* *3. lo selecciona por daño* *4. lo limpia* *5. no*	12. ¿Cuánto pagó en total para llevarla y transportarla (por U/M – por canasta, por ejemplo, o caja)?	
		4a. 2006	4b. 2006							*$C*	U/M
a.				1 2 3 4				1 2 3 4	1 2 3 4 5		
b.				1 2 3 4				1 2 3 4	1 2 3 4 5		
c.				1 2 3 4				1 2 3 4	1 2 3 4 5		
d. ***RESPUESTA GENERAL***				1 2 3 4				1 2 3 4	1 2 3 4 5		

5E. <u>PROCESADORES O EXPORTADORES</u> ***SI DESDE 2006 EL PRODUCTOR HA VENDIDO ALGÚN PRODUCTO AGRÍCOLA ALGUNA VEZ A UN EXPORTADOR O PROCESADOR → LLENE CUADROS 5E.1-3 CON LOS TRES PRODUCTOS QUE HA VENDIDO A PROCESADORES O EXPORTADORES EN CANTIDADES MAS GRANDES.***
NO → PASE A PREGUNTA 5.2

Cuadro 5E.1 Comercialización con compradores de exportadores o procesadores: Producto E.1

1. Producto que ha vendido a un procesador o exportador (**PRODUCTO E.1**) **[C5E1_P1]**													
3. Nombres de procesadores, exportadores que han comprado regularmente (producto E.1) en los últimos dos años (2006) ***→ SI DICE QUE TODOS SON IGUALES, USA "RESPUESTA GENERAL", d*** **[C5E1_P3]**	4. ¿Hace cuántos años usted vende a este comprador/en este mercado? **[C5E1_P4]**	5. Veces **por año** que ha vendido a este comprador/ en este mercado desde 2006 **[C5E1_P5a-b]**		6. Este comprador /en este mercado… ***→ MARCA TODOS QUE APLIQUEN*** *1. le paga inmediatamente el producto → **PASE A 8*** *2. le paga luego de cierto tiempo* *3. le ha dado crédito a usted* *4. le ha dado insumos para producir* **[C5E1_P6a-d]**	7. ¿ Cuántos días tarda en pagarle (a usted)? **[C5E1_P7]**	8. ¿Desde que empezó a vender a el/en este mercado, cuántas veces ha fallado en pagarle a usted? **[C5E1_P8]**	9. ¿Si entrega usted 10 cajas de (producto D.2) a este comprador/este mercado, cuántas de esas 10 cajas le rechaza? **[C5E1_P9]**	10. ¿Tiene un precio diferenciando por calidades de producto? ***→ MARCA TODOS QUE APLIQUEN*** *1. si, por tamaño* *2. si, por condición* *3. si, otro ___***[C5E1_P10c]*** *4. no* **[C5E1_P10a-d]**	11. ¿Realiza Ud. algún tipo de procesamiento antes de vender? ***→ MARCA TODOS QUE APLIQUEN*** *1. lo selecciona por tamaño* *2. lo selecciona por calidad* *3. lo selecciona por daño* *4. lo limpia* *5. no* **[C5E1_11a-e]**	12. ¿Cuánto pagó en total para llevarla y transportarla (por U/M – por canasta, por ejemplo, o caja)? **[C5E1_P12a-b]**	
		4a. 2006	4b. 2006								*$C*	U/M
a.				1 2 3 4				1 2 3 4	1 2 3 4 5			
b.				1 2 3 4				1 2 3 4	1 2 3 4 5			
c.				1 2 3 4				1 2 3 4	1 2 3 4 5			
d. ***RESPUESTA GENERAL*** **[C5E1_P3d]**				1 2 3 4				1 2 3 4	1 2 3 4 5			

5.2. ¿Alguna vez, ha vendido usted algún producto agrícola a uno de estés compradores? [P5_2]

a. Hortifrtui (Palí, La Union) [P5_2A] **SI → *PREGUNTE 5.3 Y LLENA CUADRO 5F***
b. Supermercado La Colonia [P5_2B] **SI → *PREGUNTE 5.3 Y LLENA CUADRO 5G***
c. Ambos Hortifruti y La Colonia [P5_2C] **SI → *PREGUNTE 5.3 Y LLENA CUADRO 5F Y LUEGO CUADRO 5G***
d. Vegepak (Price Smart) [P5_2D] **SI → *PREGUNTE 5.3 Y LLENA CUADRO 5G***
e. Vegyfrut [P5_2E] **SI → *PREGUNTE 5.3 Y LLENA CUADRO 5G***
f. CLUSA [P5_2F] **SI → *PREGUNTE 5.3 Y LLENA CUADRO 5G***
g. Otro Supermercado (cual) _____[P5_2Fa]

5.3. ¿Alguna ONG le ha ayudado a comercializar sus productos? [P5_3]

a. Winrock Internacional [P5_3A]
b. Technoserve [P5_3B]
c. PCI [P5_3C]
d. ADRA [P5_3D]
e. CRS/Caritas [P5_3E]
f. Save the Children [P5_3F]
g. Otro:_____ [P5_3G]

Cuadro 5F. HORTIFRUTI (Palí, La Union)

	2001 [_01]	**2002 [_02]**	**2003 [_03]**	**2004 [_04]**	**2005 [_05]**	**2006 [_06]**	**2007 [_07]**	**2008 [_08]**
¿En cuáles años desde 2000, vendió usted a Hortifruti? **→*PREGUNATAS 2-14 , SOLO LLENA LOS ANOS EN QUE VENDIO A HORTIFRUTI*** **[PF5_P1_...]**	SI NO	SI NO	SI NO	SI NO	SI NO	SI NO	SI NO	SI NO
2. ¿ En cuales años tenía usted contrato firmado con Hortifruti? **ALGUN SI → *PASE A PREGUNTA 3*** **NO → *PASE A 4*** **[PF5_P2_...]**	SI NO	SI NO	SI NO	SI NO	SI NO	SI NO	SI NO	SI NO
3. ¿ Este contrato fijó precios o usa una banda de precios (un precio mínimo)? **[PF5_P2A_...]**	Fijo Banda No	Fijo Banda NO	Fijo Banda NO	Fijo Banda NO	Fijo Banda NO	Fijo Banda NO	Fijo Banda NO	Fijo Banda NO
4. ¿La venta a Hortifruti la hizo a través de una cooperativa o individual? *1. cooperativa 2. Individual* **[PF5_P3_...]**								
5a. ¿En Donde entrega el producto? *a. en la finca →* ***PASE A 6*** *b. en la comunidad →* ***PASE A 5b*** *c. afuera de la comunidad →* ***PASE A 5b*** **[PF5_P4_...]**	a b c	a b c	a b c	a b c	a b c	a b c	a b c	a b c
5b. ¿Cual es el costo de transportar el producto? **[PF5_P4A_...]**	*$C* *U/M*	*$C* *U/M*	*$C* *U/M*	*$C* *U/M*	*$C* *U/M*	*$C* *U/M*	*$C* *U/M*	*$C* *U/M*
6. ¿Cuántos veces en el año el comprador no compró la cantidad que habían acordado? **[PF5_P5_...]**								
7. ¿Le pagaron a usted en efectivo o con cheque? **[PF5_P6_...]**	Efectivo Cheque	Efectivo Cheque	Efectivo Cheque	Efectivo Cheque	Efectivo Cheque	Efectivo Cheque	Efectivo Cheque	Efectivo Cheque
8. ¿Cuántas días tarda en pagar le el producto? **[PF5_P7_...]**								

9. ¿Cuántas veces en el año no pagó la cuenta el comprador? **[PF5_P8_...]**																
10. ¿Usted entregaba solo su cosecha a Hortifruti o también acopiaba la de otros productores para entregar? **[PF5_P9_...]** **SI →** Cuantas productores? **NO →** ***PREGUNTA 11***	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*
11. ¿Cuales tres productos le han generado mas ingresos para usted en sus entregas a Hortifruti? **→** ***LLENA 12, 13, 14 CON ESTES PRODUCTOS Y POR CADA PRODUCTO PREGUNTA SUB-CUESTION a-e***																
	2001 [_01]		**2002 [_02]**		**2003 [_03]**		**2004 [_04]**		**2005 [_05]**		**2006 [_06]**		**2007 [_07]**		**2008 [_08]**	
12. Producto 1: [C5_P10]																
12a. ¿Cuántas veces entregó por año**…** **[C5_P10A]**																
12b. ¿Cantidad por entrega (antes de la selecciona)? **[C5_P10B]**																
12c. Precio promedio del año **[C5_P10C]** U/M **[C5F-P10Ba]**																
12d. ¿Qué porcentaje del total de su producción de este producto representa esta venta? **[C5_P10D]**																
12e. ¿ Si entrega usted 10 cajas de (producto 1), cuantas de esas 10 cajas le rechaza? **[C5_P10E]**																
13. Producto 2: [C5_P11]																
13a. ¿Cuántas veces entregó por año… **[C5_P11A]**																
13b. ¿Cantidad por entrega (antes de la selecciona)? **[C5_P11B]**																
13c. Precio promedio del año **[C5_P11C]** U/M **[C5F-P11Ba]**																
13d. ¿Qué porcentaje del total de su producción de este producto representa esta venta? **[C5_P11D]**																
13e. ¿ Si entrega usted 10 cajas de (producto 2), cuantas de esas 10 cajas le rechaza? **[C5_P11E]**																
14. Producto 3: [C5_P12]																
14a. ¿Cuántas veces entregó por año… **[C5_P12A]**																
14b. ¿Cantidad por entrega (antes de la selecciona)? **[C5_P12B]**																
14c. Precio promedio del año **[C5_P12C]** U/M **[C5_P12Ba]**																
14d. ¿Qué porcentaje del total de su producción de este producto representa esta venta? **[C5_P12D]**																
14e. ¿ Si entrega usted 10 cajas de (producto 3), cuantas de esas 10 cajas le rechaza? **[C5_P12E]**																

Cuadro 5G. SUPERMERCADO LA COLONIA

	2001		2002		2003		2004		2006		2006		2007		2008	
¿En cuáles años desde 2000, vendió usted a La Colonia? → ***PREGUNATAS 2-14 , SOLO LLENA LOS ANOS EN QUE VENDIO A LA COLONIA***	SI NO		SI NO		SI NO		SI NO		SI NO		SI NO		SI NO		SI NO	
2. ¿ En cuales años tenía usted contrato firmado con La Colonia? **ALGUN SI → *PASE A PREGUNTA 3* NO → *PASE A 4***	SI NO		SI NO		SI NO		SI NO		SI NO		SI NO		SI NO		SI NO	
3. ¿ Este contrato fijó precios o usa una banda de precios (un precio mínimo)?	Fijo Banda No		Fijo Banda NO		Fijo Banda NO		Fijo Banda NO		Fijo Banda NO		Fijo Banda NO		Fijo Banda NO		Fijo Banda NO	
4. ¿La venta a La Colonia la hizo a través de una cooperativa o individual? *1. cooperativa 2. individual*																
5a. ¿En Donde entrega el producto? *a. en la finca* → ***PASE A 6*** *b. en la comunidad* → ***PASE A 5b*** *c. afuera de la comunidad* → ***PASE A 5b***	a b c		a b c		a b c		a b c		a b c		a b c		a b c		a b c	
5b. ¿Cual es el costo de transportar el producto?	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*
6. ¿Cuántos veces en el año el comprador no compró la cantidad que habian acordado?																
7. ¿Le pagaron a usted en efectivo o con cheque?	Efectivo Cheque		Efectivo Cheque		Efectivo Cheque		Efectivo Cheque		Efectivo Cheque		Efectivo Cheque		Efectivo Cheque		Efectivo Cheque	
8. ¿Cuántas días tarda en pagar le el producto (promedio por año)?																
9. ¿Cuántas veces en el año no pagó la cuenta el comprador?																
10. ¿Usted entregaba solo su cosecha a Hortifruti o también acopiaba la de otros productores para entregar? **SI →** Cuantas productores? **NO → *PREGUNTA 11***	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*
11. ¿Cuales tres productos le han generado mas ingresos para usted en sus entregas a La Colonia? → ***LLENA 12, 13, 14 CON ESTES PRODUCTOS Y POR CADA PRODUCTO PREGUNTA SUB-CUESTION a-e***																
12. Producto 1:																
12a. ¿Cuántas veces entregó por año…																
12b. ¿Cantidad por entrega (antes de la selecciona)?																
12c. Precio promedio del año																
12d. ¿Qué porcentaje del total de su producción de este producto representa esta venta?																
12e. ¿ Si entrega usted 10 cajas de (producto 1), cuantas de esas 10 cajas le rechaza?																
13. Producto 2:																
13a. ¿Cuántas veces entregó por año…																
13b. ¿Cantidad por entrega (antes de la selecciona)?																
13c. Precio promedio del año																
13d. ¿Qué porcentaje del total de su producción de este producto representa esta venta?																
13e. ¿ Si entrega usted 10 cajas de (producto 2), cuantas de esas 10 cajas le rechaza?																

	2001	2002	2003	2004	2006	2006	2007	2008
14. Producto 3:								
14a. ¿Cuántas veces entregó por año…								
14b. ¿Cantidad por entrega (antes de la selecciona)?								
14c. Precio promedio del año								
14d. ¿Qué porcentaje del total de su producción de este producto representa esta venta?								
14e. ¿ Si entrega usted 10 cajas de (producto 3), cuantas de esas 10 cajas le rechaza?								

Cuadro 5H. COMPRADOR _____

	2001		2002		2003		2004		2006		2006		2007		2008	
¿En cuáles años desde 2000, vendió usted al Comprador ____? ***→ PREGUNATAS 2-14 , SOLO LLENA LOS ANOS EN QUE VENDIO AL COMPRADOR_____***	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO
2. ¿ En cuales años tenía usted contrato firmado con el Comprador? **ALGUN SI → *PASE A PREGUNTA 3*** **NO → *PASE A 4***	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO	SI	NO
3. ¿ Este contrato fijó precios o usa una banda de precios (un precio mínimo)?	Fijo	Banda No	Fijo	Banda NO	Fijo	Banda NO	Fijo	Banda NO	Fijo	Banda NO	Fijo	Banda NO	Fijo	Banda NO	Fijo	Banda NO
4. ¿La venta a _____ la hizo a través de una cooperativa o individual? *1. cooperativa 2. individual*																
5a. ¿En Donde entrega el producto? *a. en la finca →* ***PASE A 6*** *b. en la comunidad →* ***PASE A 5b*** *c. afuera de la comunidad →* ***PASE A 5b***	a	b c	a	b c	a	b c	a	b c	a	b c	a	b c	a	b c	a	b c
5b. ¿Cual es el costo de transportar el producto?	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*	*$C*	*U/M*
6. ¿Cuántos veces en el año el comprador no compró la cantidad que habían acordado?																
7. ¿Le pagaron a usted en efectivo o con cheque?	Efectivo	Cheque	Efectivo	Cheque	Efectivo	Cheque	Efectivo	Cheque	Efectivo	Cheque	Efectivo	Cheque	Efectivo	Cheque	Efectivo	Cheque
8. ¿Cuántas días tarda en pagar le el producto (promedio por año)?																
9. ¿Cuántas veces en el año no pagó la cuenta el comprador?																
10. ¿Usted entregaba solo su cosecha a Hortifruti o también acopiaba la de otros productores para entregar? **SI →** Cuantas productores? **NO →** ***PREGUNTA 11***	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*	SI NO	*Cuantas*
11. ¿Cuales tres productos le han generado mas ingresos para usted en sus entregas al Comprador? → ***LLENA 12, 13, 14 CON ESTES PRODUCTOS Y POR CADA PRODUCTO PREGUNTA SUB-CUESTION a-e***																
12. Producto 1:																
12a. ¿Cuántas veces entregó por año…																
12b. ¿Cantidad por entrega (antes de la selecciona)?																
12c. Precio promedio del año																
12d. ¿Qué porcentaje del total de su producción de este producto representa esta venta?																
12e. ¿ Si entrega usted 10 cajas de (producto 1), cuantas de esas 10 cajas le rechaza?																

	2001	2002	2003	2004	2006	2006	2007	2008
13. Producto 2:								
13a. ¿Cuántas veces entregó por año…								
13b. ¿Cantidad por entrega (antes de la selecciona)?								
13c. Precio promedio del año								
13d. ¿Qué porcentaje del total de su producción de este producto representa esta venta?								
13e. ¿ Si entrega usted 10 cajas de (producto 2), cuantas de esas 10 cajas le rechaza?								
14. Producto 3:								
14a. ¿Cuántas veces entregó por año…								
14b. ¿Cantidad por entrega (antes de la selecciona)?								
14c. Precio promedio del año								
14d. ¿Qué porcentaje del total de su producción de este producto representa esta venta?								
14e. ¿ Si entrega usted 10 cajas de (producto 3), cuantas de esas 10 cajas le rechaza?								

SECCIÓN 5F. PRECIOS EN MERCADOS

5.4. ¿Desde el año 2003, cual es el producto que le ha generado lo mas ganancias? _____[P5_4]
5.5 ¿Cuál es la medida que usan para vender (U/M) _____[P5_5]___
5.6 ¿Cuáles son los dos mercados donde más ha vendido este producto desde 2003? [P5_6]

→ CIRCULE DOS ABAJO, LUEGO LLENA 5.7 Y 5.9 CON LAS RESPUESTAS

a. en finca
b. en el mercado local. Cual: _____ [P5_6a]
c. en el mercado regional. Cual: _____
d. en el mercado de Managua
e. a un exportador/procesador
f. a un supermercado
g. otro [P5_6b]

5.7. ***MERCADO 1*** **_____** [P5_6]
Si vende este producto a un comprador en este mercado, cual es el precio mas alto, mas bajo y mas probable que recibiera en cada temporada del año (2007)?

Cuadro 5IA. Precios de venta durante el año en el Mercado 1
→ HAY QUE LLENAR TODAS LAS TEMPORADAS, AUNQUE EL PRODUCTOR NUNCA HA VENDIDO EN UNA(S) DE LAS TEMPORADAS

	Primera [C5IA_P1]	**Postrera [C5IA_P2]**	**Apante [C5IA_P3]**
a. Precio máximo	**[C5IA_P1a]**	**[C5IA_P2a]**	**[C5IA_P3a]**
b. Precio mínimo	**[C5IA_P1b]**	**[C5IA_P2b]**	**[C5IA_P3b]**
c. Precio mas probable	**[C5IA_P1c]**	**[C5IA_P2c]**	**[C5IA_P3c]**

Cuadro 5IB 5.8. En cuales meses ha vendido el producto alguna vez usted en mercado 1?

	Enero	Feb	Mar	Abril	Mayo	Junio	Julio	Ago	Sep	Oct	Nov	Dic
1. Si *2. No* **[C5IB_...]**	**..P1]**	**..P2]**	**..P3]**	**..P4]**	**..P5]**	**..P6]**	**..P7]**	**..P8]**	**..P9]**	**..P10]**	**..P11]**	**..P12]**

5.9. ***MERCADO 2*** **_____**
Si vende este producto a un comprador en este mercado, cual es el precio mas alto, mas bajo y mas probable que recibiera en cada temporada del año (2007)?

Cuadro 5JA. Precios de venta durante el año en el Mercado 2
→ HAY QUE LLENAR TODAS LAS TEMPORADAS, AUNQUE EL PRODUCTOR NUNCA HA VENDIDO EN UNA(S) DE LAS TEMPORADAS

	Primera [C5JA_P1]	**Postrera [C5JA_P2]**	**Apante [C5JA_P3]**
a. Precio máximo			
b. Precio mínimo			
c. Precio mas probable			

Cuadro 5JB 5.10. En cuales meses ha vendido [5A1] alguna vez usted en este mercado?

Mercado [5A3B]	Enero	Feb	Mar	Abril	Mayo	Junio	Julio	Ago	Sep	Oct	Nov	Dic
3. Si *4. No*												

Cuadro 5K. ¿Para vender el producto [4A1], cual es el mercado que tiene…

	En finca	**Local**	**Regional**	**Managua**	**Supermercado**	**Otro**
…El precio mas alto **[C5K_P1]**						
…El precio mas bajo **[C5K_P2]**						
…El precio mas estable **[C5K_P3]**						
…El precio mas inestable **[C5K_P4]**						
..Requisitos para el productomas exigentes **[C5K_P5]**						
...Requisitos para el producto menos exigentes **[C5K_P6]**						

Hato Ganado Mayor

6.1. Durante el último año tenía ganado propio o otros animales en sus fincas? _____

Sí → *LLENE EL CUADRO 6A*
No → *PASA A LA PREGUNTA 6.2*

Cuadro 6A. Hato Ganado Mayor

1. Tipo de Animal [C6A_P1]	2. Cantidad actual [C6A_P2]	Registre el número de pérdidas, el consumo, las compras y las ventas en LOS ÚLTIMOS 12 MESES								
		3. Cantidad muerto o robado [C6A_P3]	4. Cantidad consumida [C6A_P4]	5. Cantidad nacidos [C6A_P5]	Compras		Ventas			
					6. Cantidad comprada [C6A_P6]	7. ¿Cuánto gastó en total en las compras? C$ [C6A_P7]	8. Cantidad Vendida [C6A_P8]	9. ¿Cuánto recibió en total en las ventas? C$ [C6A_P9]	10. ¿Cuánto gastó en transporte por las ventas? C$ [C6A_P10]	11. ¿Quién administra el dinero de estas ventas? Codigo personal [C6A_P11]
(1) Terneros menores o iguales a 1 año										
(2). Terneros mayores de 1 año y menores o igual a 2 años										
(3). Novillos de 2-3 años										
(4). Vacas paridas										
(5). Vacas horras										
(6). Toros padrotes										
(7). Bueyes										
(8). Mulas/machos										
(9). Caballos										
(10) Vaquillas										
(11) Novillos mayores de 3 años										
[C6B_P1]	[C6B_P2]	[C6B_P3]	[C6B_P4]	[C6B_P5]	[C6B_P6]	[C6B_P7]	[C6B_P8]	[C6B_P9]	[C6B_P10]	[C6B_P11]
(12) cerdos										
(13) cabras										
(14) ovejas, pelibuey										
(15) aves (sumar gallinas, patos, gansos, etc.)										
(16) huevos			[C6C_P1]				[C6C_P2]	[C6C_P3]		
(17) apicultura						[C6C_P4]		[C6C_P5]		
(18) Otros, especifique:										

PRODUCCION LECHERA Y VENTAS DE LÁCTEOS

6.2 En el último año, en su hogar hubo producción de leche y/o venta de lácteos? __ **[P6_2]** ___
1. SI….→ ***LLENE EL CUADRO 6B*** 2. NO….→***PASE A LA PREGUNTA 6.3.***

Cuadro 6D Producción y Venta de Productos Lácteos

		Verano (1)				Invierno (2)			
	unidad	**1. Cantidad Producida** **[C6D_P1A]**	**2. Cantidad consumida o procesada en Casa** **[C6D_P1B]**	**3. Cantidad Vendida**	**4. Precio unitario** *C$*	**1. Cantidad Producida** **[C6B_P1E]**	**2. Cantidad consumida o procesada en casa** **[C6B_P1F]**	**3. Cantidad Vendida**	**4. Precio unitario** *C$*
(1)Leche	gln/día			**[C6D_P1C]**	**[C6D_P1D]**			**[C6D_P1G]**	**[C6D_P1H]**
(2)Queso	lb/semana			**[C6D_P2C]**	**[C6D_P2D]**			**[C6D_P2G]**	**[C6D_P2H]**
(3)Cuajada	lb/semana			**[C6D_P3C]**	**[C6D_P3D]**			**[C6D_P3G]**	**[C6D_P3H]**
(4)Mantequilla	lb/semana			**[C6D_P4C]**	**[C6D_P4D]**			**[C6D_P4G]**	**[C6D_P4H]**
(5)Crema	lb/semana			**[C6D_P5C]**	**[C6D_P5D]**			**[C6D_P5G]**	**[C6D_P5H]**

6.3 ¿Ud tuvo algún gasto asociado a la actividad pecuaria en el año pasado? _____ [P6_3]

1. SI…..... → ***REGISTRE LOS COSTOS TOTALES DEL ÚLTIMO AÑO EN EL CUADRO 6D***
2. NO….. → ***PASE A LA PREGUNTA 6.4.***

Cuadro 6E. COSTOS PECUARIOS DURANTE EL ULTIMO AÑO

1. Tipo de gasto	**Gasto Total** *C$*
(1) Mano de Obra Contratada Temporalmente (EXCLUYE MANO DE OBRA PERMANENTE—MAYOR DE 6 MESES CONTINUOS))	**[C6E_P1]**
(2) Insumos pecuarios	**[C6E_P2]**
(3) Alimentación Complementaria	**[C6E_P3]**
(4) Transporte	**[C6E_P4]**
(5) Materiales	**[C6E_P5]**
(6) Servicios veterinarios	**[C6E_P6]**

MANO DE OBRA PERMANENTE

5.4. ¿Durante el año pasado Usted empleó trabajadores permanentes para ayudarle en cualquier trabajo de su finca (agrícola o pecuaria)? **___[P6_4]__**

1. SI…..... → ***LLENA EL CUADRO 6E***
2. NO….. → ***PASA A LA SECCION 7***

ASEGURE QUE LA MANO DE OBRA REGISTRADA EN ESTE CUADRO NO FUE INCLUIDA ANTES CUANDO SE REGISTRÓ MANO DE OBRA TEMPORAL.
CUADRO 6F. Gastos en mano de obra permanente

	1. Tipo de Trabajador	**2. ¿Cuántos meses trabajó en el último año?**	**3. ¿Cuál es el salario mensual**	**(NUMERO DE TRABAJADORES)**
01	Administrador	**[C6F_P1A]**	**[C6F_P1B]**	**[C6F_P1C]**
02	Contador	**[C6F_P2A]**	**[C6F_P2B]**	**[C6F_P2C]**
03	Secretaria	**[C6F_P3A]**	**[C6F_P3B]**	**[C6F_P3C]**
04	Bodeguero	**[C6F_P4A]**	**[C6F_P4B]**	**[C6F_P4C]**
05	Conductor	**[C6F_P5A]**	**[C6F_P5B]**	**[C6F_P5C]**
06	Mandador	**[C6F_P6A]**	**[C6F_P6B]**	**[C6F_P6C]**
07	Capataz	**[C6F_P7A]**	**[C6F_P7B]**	**[C6F_P7C]**
08	Cocinera	**[C6F_P8A]**	**[C6F_P8B]**	**[C6F_P8C]**
09	Operador de riego	**[C6F_P9A]**	**[C6F_P9B]**	**[C6F_P9C]**
10	Campistos	**[C6F_P10A]**	**[C6F_P10B]**	**[C6F_P10C]**
11	Ordeñadores	**[C6F_P11A]**	**[C6F_P11B]**	**[C6F_P11C]**
12	Otros (especifique)	**[C6F_P12A]**	**[C6F_P12B]**	**[C6F_P12C]**

SECCION 7 MAQUINARIA Y EQUIPO

Cuadro 7A Inventario y Compras de Maquinaria y Equipos Agropecuarios

	Tipo de Maquinaria/Equipo	¿Que cantidad de […] tenía en el año .. [C7A_...										¿En cuánto podría vender hoy día, todos estos [EQUIPOS] en el estado en que se encuentran?
		1. 1996?	2. 2000?	3. 2001?	4. 2002?	5. 2003?	6. 2004?	7. 2005?	8. 2006?	9. 2007?	10. 2008?	11. *C$ total*
		..P96]	..P00]	..P01]	..P02]	..P03]	..P04]	..P05]	..P06]	..P07]	..P08]	[C7A_P3]
1.	Tractor											
2.	Arado de tractor											
3.	Arado de bueyes											
4.	Grada de tractor											
5.	Grada de bueyes											
6.	Sembradora de tractor											
7.	Sembradora de bueyes											
8.	Pulverizador para tractor											
9.	Rastra de tractor											
10.	Carreta de bueyes											
11.	Bomba mochila											
12.	Fumigadora de motor											
13.	Picadora de pastos											
14.	Cosechadora											
15.	Trapiche											
16.	Descremadora											
17.	Despulpadora											
18.	Motosierra											
19.	Ordenadora mecánica											
20.	Bomba de riego											
21.	Generador eléctrico											
22.	Camioneta											
23.	Camiones											
24.	Corral para ganado											
25.	Gallinero											
26.	Corral para aves											
27.	Chiqueros											
28.	Pilas											
29.	Baño garrapaticida											
30.	Establos											
31.	Silo forrajero											
32.	Desfibradora											
33.	Empacadora/ seleccionadora											
34.	Beneficio de café/cacao											
35.	Molino											
36.	Bodegas											
37.	Silo para granos											
38.	Horno											
39.	Patio de secado											
40.	Galerón											
41.	Pozo para riego											
42.	Represas											
43.	Pivote Central											
44.	Otro: **[C6A_P1B]**											
45.	Riego de Gravedad (Superficie) (mzs)											
46.	Riego de Aspersión (mzs)											
47.	Riego de Pivote Central (mzs)											
48.	Riego de Goteo (mzs)											

SECCION 8: FINANCIAMIENTO

Créditos Recibidos en 2007

Durante los últimos 12 meses, Ud o otro miembro del hogar recibió un crédito - o sea para la actividad agropecuaria, negocio, construcción de casa, necesidades familiares, etcetera, de:

[C8A_P0] **1**……SI **2**……NO

Cuadro 8A Fuentes de crédito

Instituciones Formales Reguladas		Instituciones Formales No Reguladas		Instituciones Informales	
1. Banco privado	**[C8A_P1]**	3. Cooperativa o Asociación de productores	**[C8A_P3]**	8. Comerciante	**[C8A_P8]**
2. Cooperativa de ahorro y crédito	**[C8A_P2]**	4. Banco no convencional	**[C8A_P4]**	9. Acopiador	**[C8A_P9]**
		5. Caja Rural	**[C8A_P5]**	10. Prestamista	**[C8A_P10]**
		6. ONG o Proyecto	**[C8A_P6]**	11. Otro agricultor de la zona	**[C8A_P11]**
		7. Programa del MAGFOR o gobierno	**[C8A_P7]**	12. Familiar o amigo	**[C8A_P12]**
				13. Cualquiér otra fuente	**[C8A_P13]**

INSTRUCCION AL ENCUESTADOR: SUME EL NUMERO DE ✔'S QUE APARECEN EN EL CUADRO 8A.
-SI NO RECIBIO NINGUN CREDITO, PASE A LA PREGUNTA 8.1.
-SI OBTUVO UNO O MAS CREDITOS, REGISTRE LOS DATOS EN EL CUADRO 8B, QUE APARECE EN LA SIGUIENTE PAGINA.

-REGISTRE CADA CREDITO EN UNA FILA DISTINTA.

Cuadro 8B. Créditos recibidos en los últimos 12 meses

1. No. de Orden **[C8B_P1]**	**2. ¿Quién recibió el crédito?** *(Código personal)* **[C8B_P2]**	**3. Fuente del crédito** *Clave 1* **[C8B_P3]**	**4. Monto total del crédito** *C$* **[C8B_P4]**	**Tasa de interés:** **5. ¿Cuál es la tasa de interés que le cobra?** *%* **[C8B_P5]**	**6. ¿ Cuál es la unidad de tiempo a que se refiere la tasa de interés?** *Clave 2* **[C8B_P6]**	**7.)Cuál es el plazo del crédito?** *meses* **[C8B_P7]**	**8. ¿Hubiera querido un crédito más grande?** *(a la misma tasa y plazo)* **1. SI → *SIGUE CON 9*** **2. NO → *PASE A 13*** **[C8B_P8]**	**9. ¿Cuánto crédito *adicional* hubiera querido?** *C$* **[C8B_P9]**	**¿Qué tipos de garantía le exigió?** **13. Tipo 1** *Clave 3* **[C8B_P10]**	**14. Tipo 2** *Clave 3* **[C8B_P11]**	**15. Tipo 3** *Clave 3* **[C8B_P12]**	**16. ¿Valor total de las garantias?** *C$* **[C8B_P13]**	**26 ¿Cuántos créditos (previo a este) recibió de esta misma fuente?** **[C8B_P14]**	**27. ¿En qué forma tiene que cancelar este crédito?** *1. Sólo en efectivo* *2. Sólo en producto* *3. Sólo en mano vuelta* *4. En ambos efectivo y producto* *5. En ambos efectivo y mano vuelta* **[C8B_P15]**
1														
2														
4														
5														

Clave 1

1. Banco privado
2. Cooperativa de ahorro y crédito
3. Cooperativa o Asociación de productores
4. Banco no convencional
5. Caja Rural
6. ONG o Proyecto
7. Programa del MAG o gobierno
8. Comerciante
9. Acopiador
10. Prestamista
11. Otro agricultor de la zona
12. Familiar o amigo
*13. Otro __ **[C8B_P3B]**__*

Clave 2

1. Ano
2. Mes
3. Quincena
4. Semana
5. Día
6. Otro_____
[C7B_P9B]

Clave 3

1. Tierra titulada
2. Tierra no titulada
3. Vivienda
4. La cosecha
5. Ganado
6. Vehiculo/maquinaria
7. Aval de otro
8. Grupo solidario
9. No dio ninguna garantia
10. Otro _____

NOTA AL ENCUESTADOR: ANTES DE SEGUIR A LA SIGUIENTE SECCION, VEREFIQUE QUE EL NUMERO DE CREDITOS REGISTRADOS EN EL CUADRO 8B ES IGUAL (O MAYOR) AL NUMERO DE ✔'S MARCADAS EN EL CUADRO

DEUDA ANTERIOR

8.1. ¿Ud tenía alguna deuda al comienzo del año agrícola 2007 (Marzo del año pasado)? **[P8_1]____**

1. SI ..... → ***SIGA CON EL CUADRO 8C*** .
2. NO..... → ***PASE AL CUADRO 8D***.

Cuadro 8C Deudas al comienzo del ano agrícola pasado

1. **No. de orden**	**2.** **Fuente del crédito** *Clave 1*	**3.** **¿Cuál fue el monto total del crédito?** *C$* **[C8C_1_3-3_3]**	**4.** **¿Cuál es el saldo que aún debe?** *C$* **[C8C_1_4-3_4]]**	**5.** **¿Va al día con sus pagos?** *1. Si* *2. No* **[C8C_1_5-3_5]**	**6.** **¿Si la respuesta a la 5. fue NO, cuál es el monto en mora?** *C$* **[C8C_1_6-3_6]**
1	**[C8C_P1A]**	**[C8C_P2A]**	**[C8C_P3A]**	**[C8C_P4A]**	**[C8C_P5A]**
2	**[C8C_P1B]**	**[C8C_P2B]**	**[C8C_P3B]**	**[C8C_P4B]**	**[C8C_P5B]**
3	**[C8C_P1C]**	**[C8C_P2C]**	**[C8C_P3C]**	**[C8C_P4C]**	**[C8C_P5C]**

Clave 1

1. Banco privado
2. Cooperativa de ahorro y crédito
3. Cooperativa o Asociación de productores
4. Banco no convencional
5. Caja Rural
6. ONG o Proyecto
7. Programa del MAGfFOR o gobierno
8. Comerciante
9. Acopiador
10. Prestamista
11. Otro agricultor de la zona
12. Familiar o amigo
13. Otro _____[C8C_P1A-Ca]

AHORROS

Cuadro 8D Stocks de ahorros financieros y en especie

	1. **Granos y otros cultivos** *C$* **[C8D_P1]**	**2.** **Insumos** *C$* **[C8D_P2]**	**3.** **Efectivo** *C$* **[C8D_P3]**	**4.** **Cuenta Bancaria** *C$* **[C8D_P4]**
Valor Actual				

SECCIÓN 9. Eventos Inesperados

Las Lluvias de Octubre, 2007

¿A los hogares les ocurren eventos inesperados como las lluvias de 2007. Quisiera preguntarle acerca de los efectos de las lluvias de Octubre, 2007 en su hogar.

9.1. Cuando pasaron las lluvias de Octubre de 2007 le afectó negativamente? _____ [P9_1] 1. Si → ***LLENE EL CUADRO 9A*** 2. No → ***PASE AL CUADRO 9C***

Cuadro 9A. Las Lluvias de Octubre, 2007

1. Evento Provocado por las lluvias de Octubre, 2007 **[C9A_P1]**	**2. ¿Ocurrió [..] en este hogar como resultado de las lluvias de Octubre, 2007?** *Sí ... 1* *No ... 2 → SIGUIENTE EVENTO*	**3.. ¿Cuánto tiempo duró?** ***# deMeses Ponga 99 si sigue actualmente*** **[C9A_P2]**	**4. ¿En cuánto se redujo el ingreso mensual?** *C$* **[C9A_P3]**	**5. ¿En total, cuánto gastó debido a este evento?** *C$* **[C9A_P4]**	**6. ¿Cuál fue el cultivo perdido?** *Clave 1* **[C9A_P5] otro: [C9A_P5a]**	**7. ¿Cuantas Mzs se perdieron?** *mzs* **[C9A_P6]**	**8. ¿Cuánto fue el valor del cultivo perdido?** *C$* **[C9A_P7]**	**9. ¿Cuánto fue el valor de los bienes perdidos?** *C$* **[C9A_P8]**
(1)Muerte de miembro del hogar o de otro miembro de la familia	**1 2**							
(2)Lesión seria que no permite al miembro del hogar trabajar	**1 2**							
(3)Pérdida de un trabajo regular de un miembro del hogar	**1 2**							
(4)Paró o bajó la cantidad de remesas que recibe el hogar	**1 2**							
(5)Paró o bajó pagos del gobierno (no por motivo de muerte)	**1 2**							
(6)Robo, incendio, o destrucción de bienes del hogar	**1 2**							
(7) Perdida de cultivos. →***LLENA UNA LINEA POR CADA CULTIVO PERDIDO***								
(7a)Pérdida grande de un cultivo, e.g. inundación, peste	**1 2**							
(7b)Pérdida grande de cultivo, e.g. inundación, peste	**1 2**							
(7c)Pérdida grande de cultivos, e.g. inundación, peste	**1 2**							
(7d)Pérdida grande de cultivos, e.g. inundación, peste	**1 2**							
(7e)Pérdida grande de cultivo, e.g. inundación, peste	**1 2**							
(8)Muerte en forma masiva de animales	**1 2**							
(9)Pérdida o deterioración seria de tierra	**1 2**							
(10)Fracaso o bancarota de negocio	**1 2**							
(11)Otro, especifique…….**[C9A_P1a]**	**1 2**							

Clave 1: Nombre de Cultivo 1. Maiz 2. Frijol 3. Arroz 4. Sorgo Industrial 5. Sorgo Millon 6. Sorgo Blanco 7.Sorgo Escobero 8. Ajonjolí 9. Maní 10. Soya 11. Café 12. Cacao 13. Yuca 14. Malanga 15. Quesquisque 16. Musaceas 17. Cebolla 18. Chiltoma 19. Zanahoria 20. Ayote 21. Papa. 22. Gengibre…23. Chile. 24. Tomate. 25. Pipian 26.Ajo 27. Sandia/Melon 28. Otras Frutas 29. Pitahaya 30. Cítricos 31. Repollo 32. Caña de Azuca 33. Piña 34. Aguacate 35. Tempate 36. Tamarindo 37 Especias maderables

Cuadro 9B

Después de se ocurrieron las lluvias, el hogar tomó alguna de estas medidas? **(circule SI o NO)**				
1. **¿Usar ahorros?** **[C9B_P1]**	**2.** **¿Pedir préstamo familiar o de prestamista?** **[C9B_P2]**	**3.** **¿Sacar a los niños de la escuela** **[C9B_P3]**	**4.** **¿Buscar ayuda de otros?** **[C9B_P4]**	**.5** **¿Otros?** **[C9B_P5]** **Y** **[C9B_P5a]**
SI NO	**SI NO**	**SI NO**	**SI NO**	**SI NO**

9.2. El hogar tuvo que vender bienes después de las lluvias de Octubre 2007? _____**[P9_2]**
1…..SI → ***.SIGUE CON LA PREGUNTA 9.3***
2….NO → ***.PASE A LA PREGUNTA 9.5.***

9.3 ¿Qué tipo de bien vendió? _____**[P9_3]**

1. Ganado
2. Maquinaria
3. Electrodoméstico
4. Tierra agrícola
5. Tierra residencial
6. Otro _____**[P9_3a]**

9.4 ¿Cuál fue el valor total de los bienes que vendió debido a las lluvias? _____**[98_4]** (C$)

9.5. ¿ Recibió Ud. algún tipo de ayuda después de las lluvias? _____**[P9_5]**
1…..SI → ***LLENE EL CUADRO 9C.***
2….NO → ***PASE AL CUADRO 9D.***

Cuadro 9C

1. **Tipo de Ayuda**	¿Recibió los siguientes tipos de ayuda? *1. Si* *2. No*	**2.** ¿Si recibió alimentación, por cuántos meses?	**3.** ¿De quién recibió esta ayuda? *Clave 1*	*Clave 1* *1. Gobierno* *2. Proyecto* *3. ONG* *4. Iglesia* *5. Otro* **[C9C_…**
(1)Alimentación	**[C9C_P1A]**	**[C9C_P2A]**	**[C9C_P3A]**	
(2)Efectivo	**[C9C_P1B]**		**[C9C_P3B]**	
(3)Materiales/ Herramienta	**[C9C_P1C]**		**[C9C_P3C]**	
(4)Vivienda	**[C9C_P1D]**		**[C9C_P3D]**	
(5)Otro	**[C9C_P1E]**		**[C9C_P3E]**	

OTROS EVENTOS ECONÓMICOS INESPERADOS

Ahora quisiera preguntarle acerca de otros eventos inesperados que se les ha acontecido durante los últimos 5 años fuera de las lluvias de Octubre, 2007. SONDEAR CADA ITEM EN LA LISTA

Cuadro 9D Otros Eventos Económicos Inesperados

1. Evento [C9D_P1]	2. ¿Ocurrió [..] en este hogar? *Sí ..... 1 No ... 2 → SIGUIENTE EVENTO*	3. ¿Cuánto tiempo duró? # de Meses Ponga 99 si sigue actualmente [C9D_P2]	4. ¿En cuánto se redujo su ingreso mensual debido a este evento? *C$* [C9D_P3]	5. ¿En total, cuánto gastó debido a este evento? *C$* [C9D_P4]	6 ¿Cuál fue el principal cultivo que se perdió? *Clave 1* [C9D_P5] otro: [C9D_P5a]	7. ¿Cuántas Mzs se perdió? [C9D_P6]	8. ¿Cuánto fue el valor de los bienes o cultivos perdidos? *C$* [C9D_P7]	9. ¿Después de que se ocurrió el evento, que hizo el hogar? Vender bienes o usar ahorros [C9D_P9]	Obtener Préstamo Familiar o de Prestamista [C9D_P10]	Utilizar Seguros [C9D_P11]	Otros (especifique) [C9D_P12]
(1)Muerte de miembro del hogar o de otro miembro de la familia	1 2							1 2	1 2	1 2	1 2
(2)Lesión seria que no permite al miembro del hogar trabajar	1 2							1 2	1 2	1 2	1 2
(3)Pérdida de un trabajo regular de un miembro del hogar	1 2							1 2	1 2	1 2	1 2
(4)Paró o bajó la cantidad de remesas que recibe el hogar	1 2							1 2	1 2	1 2	1 2
(5)Paró o bajó pagos del gobierno (no por motivo de muerte)	1 2							1 2	1 2	1 2	1 2
(6)Robo, incendio, o destrucción de bienes del hogar	1 2							1 2	1 2	1 2	1 2
(7)Pérdida grande de cultivos, e.g. inundación, peste	1 2							1 2	1 2	1 2	1 2
(8)Muerte en forma masiva de animales	1 2							1 2	1 2	1 2	1 2
(9)Pérdida o deterioración seria de tierra	1 2							1 2	1 2	1 2	1 2
(10)Fracaso o bancarota de negocio	1 2							1 2	1 2	1 2	1 2
(11)Otro, especifique.. **[C9D_P1a]** …	1 2							1 2	1 2	1 2	1 2

Clave 1: Nombre de Cultivo

1. Maiz 2. Frijol 3. Arroz 4. Sorgo Industrial 5. Sorgo Millon 6. Sorgo Blanco 7.Sorgo Escobero 8. Ajonjolí 9. Maní 10. Soya 11. Café 12. Cacao 13. Yuca 14. Malanga 15. Quesquisque 16. Musaceas 17. Cebolla 18. Chiltoma 19. Zanahoria 20. Ayote 21. Papa. 22. Gengibre…23. Chile. 24. Tomate. 25. Pipian 26.Ajo 27. Sandía/Melon 28. Otras Frutas 29. Pitahaya 30. Cítricos 31. Repollo 32. Caña de Azuca 33. Piña 34. Aguacate 35. Tempate 36. Tamarindo 37 Especias maderables 38. Otro, esp…

SECCIÓN 10. RELACIONES EXTERNAS Y CAPITAL SOCIAL

1. Tipo de Grupo	2. ¿Pertenece algún miembro del hogar a alguna organización? *caso sí, ponga el código personal. caso toda la familia, ponga 00*		3 ¿En 2000 pertenecía algún miembro del hogar a alguna organización *caso sí, ponga el código personal. caso toda la familia, ponga 00*		4. ¿Para Ud., es [….] una fuente de servicios productivos como: *1.Capacitación/Asist. Técnica 2.Crédito 3.Insumos Agro. 4.Maq. 5.Procesamiento 6.Transporte de productos 7.Venta de prod.?* *Sí→¿Cuales? Códigos*			5. ¿Cuál es la composición del grupo? *1. Sólo hombres 2. Sólo Mujeres 3. Ambos*	6. ¿Es necesario pagar dinero para poder entrar en el grupo? *0. No; caso sí, ponga el monto C$*	7. ¿Tiene que pagar dinero cada mes como miembro del grupo? *0. No; caso sí, ponga el monto C$/mes*	8. ¿Hace cuántos años se formó este grupo? *1. De 0 - 5 años 2. De 6-20 años 3. Más que 20*	9. ¿Por cuántos años ha pertenecido Ud. o miembros de su familia a este grupo? *Años*	10. ¿Qué pasa cuándo una persona viola los reglamentos del grupo? *1.Tiene que salir del grupo 2. Tiene que pagar una multa 3.Nada pasa*	11. ¿De las reuniones del grupo, a cuántas asiste el miembro/los miembros del hogar? *1. Ninguna 2. Pocas 3. Algunas 4. Muchas 5. Todas*		12. Por lo más, ¿cómo funciona el grupo? *1. Muy Débil 2. Débil 3. Regular 4. Fuerte 5. Muy Fuerte*	
	Pers. 1	*Pers. 2*	*Pers. 1*	*Pers. 2*											Ahora	en 2000	Ahora	en 2000
[P10_1]	[P10_2A]	[P10_2B]	[P10_3A]	[P10_3B]	[P10_4A]	P10_4B]	[P10_4C]	[P10_5]	[P10_6]	[P10_7]	[P10_8]	[P10_9]	[P10_10]		[P10_11A]	[P10_11B]	[P10_12A]	[P10_12B]
(1)Cooperativa																		
(2)Org. Gremial																		
(3)Grupo Informal de Productores																		
(4)ONG/Proyecto																		
(5)Tienda Campesina																		
(6)Seguros Mutuas																		
(7)Club Deportivo																		
(8)Org. Política																		
(9)Org. para proveer servicios (escuela, agua, …)																		
(10)Iglesia																		
(11)Org Mujer																		
(12)Otro (especifique) [P10_1B]																		
(13)Otro (especifique) _____ [P10_1a]																		

SECCIÓN 11. ENTORNO ECONOMICO

Cuadro 11A. Infraestructura

	1. Favor indique a qué distancia en kilómetros se encuentra la instalación o infraestructura más cercana	2. Cual Mercado?	Favor indique ... 3. Cuánto tiempo se necesita para llegar a la instalación o infraestructura más cercana *(minutos)*	4. Por cual tipo de transporte? *Clave 1* otro: [C11A_P2Ac-P2Kc]	5. Cuánto cuesta ida y vuelta el viaje? *C$*
Centro de acopio	[C11A_P1A]		[C11A_P2A]	[C11A_P2Ab]	[C11A_P2Ad]
Distribuidor de insumos	[C11A_P1B]		[C11A_P2B]	[C11A_P2Bb]	[C11A_P2Bd]
Gasolinera	[C11A_P1C]		[C11A_P2C]	[C11A_P2Cb]	[C11A_P2Cd]
Mercado	[C11A_P1D]	[C11A_P1Da]	[C11A_P2D]	[C11A_P2Db]	[C11A_P2Dd]
Sucursal bancaria	[C11A_P1E]		[C11A_P2E]	[C11A_P2Eb]	[C11A_P2Ed]
Cooperativa de crédito	[C11A_P1F]		[C11A_P2F]	[C11A_P2Fb]	[C11A_P2Fd]
Una oficina de gobierno que ofrece crédito o una ONG que ofrece crédito?	[C11A_P1G]		[C11A_P2G]	[C11A_P2Gb]	[C11A_P2Gd]
Centro de salud	[C11A_P1H]		[C11A_P2H]	[C11A_P2Hb]	[C11A_P2Hd]
Escuela primaria	[C11A_P1I]		[C11A_P2I]	[C11A_P2Ib]	[C11A_P2Id]
Escuela secundaria	[C11A_P1J]		[C11A_P2J]	[C11A_P2Jb]	[C11A_P2Jd]
Carretera pavimentada	[C11A_P1K]		[C11A_P2K]	[C11A_P2Kb]	[C11A_P2Kd]

Clave 1: 1.Pie 2.Bicicleta 3.Moto 4.Transporte publico 5.Carro privado 6. Animal 7. Otro _____

Cuadro 11B. Características de la Comunidad

1. ¿En que año entró la red de Claro en la comunidad? [C11B_P1]	2. ¿En que año entró la red de Movistar en la comunidad? [C11B_P2]	3. ¿Hay acceso de agua en la comunidad todo el año para cultivar? [C11B_P3]	4. ¿Tiene poso para riego usted? *1. Si → PASE A 5 2. No → PASE A 6* [C11B_P4]	5. ¿De que profundidad es el poso? *Distancia* [C11B_P5]	*1. mts 2. vrs* [C11B_P5b]	6. ¿Que profundidad tuviera que cavar para encontrar agua? *Distancia* [C11B_P6]	*1. mts 2. vrs* [C11B_P6b]

Cuadro 11C. Características del Hogar

1. **¿Qué material predomina en las paredes de su vivienda?** 1. *Ladrillo o bloque de barro* 2. *Bloque de cemento* 3. *Adobe o taquezal* 4. *Piedra cantera* 5. *Nicalit* 6. *Bambú o caña* 7. *Madera* 8. *Ripio o desecho* 9. *Minifalda (madera y bloque o ladrillo)* 10. *Otro* **[C11D_P1b]**	2. **¿Qué material predomina en el piso de su vivienda?** 1. *Tierra* 2. *Madera* 3. *Embaldosado* 4. *Ladrillo* 5. *Otro*	3. **¿Cuántos cuartos dormitorios tiene la casa?** #	4. **¿Cómo obtienen agua potable?** 1. *Red pública* 2. *Puesto* 3. *Camión, carreta o pipa* 4. *Pozo* 5. *Río, quebrada u ojo de agua* 6. *Otro*	5. **¿A qué está conectado el desagüe de la vivienda?** 1. *Red* 2. *Pozo séptico* 3. *Pozo ciego o sumidero* 4. *No tiene*	6. **¿Qué tipo de alumbrado tiene?** 1. *Servicio eléctrico* 2. *Candil, gas* 3. *Planta eléctrica* 4. *Ninguno*	7. **¿Si Ud. alquilara esta casa a otra persona, a qué precio podría alquilarlo?** *$C*	8. **¿Si Ud. vendiera esta casa, a qué precio podría venderlo?** *$C*	9. **¿Tiene otra casa o propiedad en otro lugar?** 1. *Sí → **PASE A 10*** 2. *No → **PASE AL CUADRO 11D***	10. **¿Cuál es el valor aproximado de la otra casa o propiedad?** *C$*
[C11D_P1]	**[C11D_P2]**	**[C11D_P3]**	**[C11D_P4]**	**[C11D_P5]**	**[C11D_P6]**	**[C11D_P7]**	**[C11D_P8]**	**[C11D_P9]**	**[C11D_P10]**

Cuadro 11D. Bienes Del Hogar

		¿Que cantidad de […]tenía en año .. [C11D…										**12.** **¿En cuánto podría vender hoy día, todos estos [EQUIPO] en el estado en que se encuentran?**
	[C11D_P1]	**2. 1996? _P96]**	**3. 2000? _P00]**	**4. 2001? _P01]**	**5. 2002? _P02]**	**6. 2003? _P03]**	**7. 2004? _P04]**	**8. 2005? _P05]**	**9. 2006? _P06]**	**10. 2007? _P07]**	**11. 2008? _P08]**	*C$ en total* **[C11D_P2]**
1	Radio											
2	Televisor B/N											
3	Televisor color											
4	Refrigerador											
5	Cocina											
6	Plancha											
7	Máquina de moler											
8	Radiograbadora											
9	Equipo de Sonido/Mini componente											
10	Abanico											
11	Licuadora											
12	Tostadora											
13	Horno											
14	Horno de microonda											
15	Arrocera											

16	Lavadora											
17	Aire acondicionado											
18	Máquina de coser											
19	Máquina de escribir											
20	Computadora											
21	Vehículo (que no sea camioneta ni camión)											
22	Bote											
23	Bicicleta											
24	Motocicleta											
25	CD player/DVD											
26	Teléfono (no celular)											
27	Celular											
28	Libros											
29	Otro **[C11D_P1A]**											

→ ***SI LA CASA TIENE CELULAR, PREGUNTE LO SIGUENTE***
11.1. ¿Cuanta gasta el hogar por semana en saldo (tarjetas para celulares)? _____ **[P11_1]**

11.2 En el ciclo pasado (Marzo2007 – Marzo2008) ¿buscó tierras adicionales para agricultura o ganadería? _____ **[P11_2]**
SÍ → ***11.3*** NO → ***PASE A LA PREGUNTA 11.4***

11.3 ¿Encontró toda la tierra que quería? [P11_3]
0. NO
1. SI, pero el costo de alquiler era muy alto
2. SI, pero no tenía el capital para cultivar más
3. SI, pero otra razón (especifique)_____
4. SI, pero otra razón (especifique) _____ **[P11_3B]**
5. SI, pero otra razón (especifique)_____

11.4 ¿Por qué no? ___[P11_4] _____
6. No necesitaba más tierras
7. Si la quería, pero no tenia el capital para cultivar más
8. Si la quería, pero no quería el riesgo de cultivar más
9. Si la quería, pero no hubo tierras disponibles
10. Otro (especifique) _____ **[P11_4B]**

11.5. Me gustaría preguntarle sobre su historia como productor y como llegó a su situación actual. Me gustaría saber un poco sobre la experiencia de sus padres en el agro:
¿Cual fue la ocupación principal de sus padres? **[P11_5]** _____ (***Clave*****:** *1. Agrícultura; 2. Comercio; 3. Trabajo no agrícola; 4. Profesional; 5. Otro* _____ **[P11_5B]**

→ ***SI LA RESPUESTA ES "1—AGRICULTURA", SIGA CON LA PREGUNTA 11.5.1; SI NO, PASE A LA PREGUNTA 11.6***

11.5.1. ¿Cuántas tierras trabajaban sus padres cuando Ud. empezó a trabajar por su propia cuenta? _____ Mzs. **[P11_5_1]**

11.5.2. ¿Cuántas manzanas fueron propias? _____Mzs. **[P11_5_2]**

11.6 ¿En que año empezo usted a trabajar su propia finca? _____ **[P11_6]**
11.7 ¿Antes de empezar a trabajar su propia finca, ¿qué tipo de trabajo realizaba? _____**[P11_7]**
(*Clave: 1. Obrero agrícola; 2. Comerciante; 3. Obrero no agrícola; 4. Profesional; 5. Siempre cultivaba tierra propia o familiar; 6. Jefe de campo; 7. No trabajaba; 8. Otro* **[P10_2B]** *)*

SECCIÓN 12. GASTOS EN ALIMENTOS EN LOS ULTIMOS 7 DIAS

1) **ESTA SECCIÓN SE DEBE CONTESTAR LA PERSONA EN EL HOGAR RESPONSABLE PARA LA PREPARACION DE LA COMIDA**
2) **PRIMERO, HAGA PREGUNTA 1. PARA CADA TIPO DE COMIDA EN LA LISTA.**
3) **SEGUNDO, PARA CADA COMIDA CON RESPUESTA "SÍ" HAGA LA PREGUNTA 2.**

12.1 ¿Se hacen tortillas en la casa o la compra? _____[P12_1]

CUADRO 12A Gastos en alimentos

Alimento	Cod.	1. ¿Durante los últimos 7 días, ¿comió [..] en este hogar? Sí No	2. ¿Cuál era el valor de [..] que comieron de sus compras en los últimos 7 días? C$
Maiz	1	[C12A_P1]	[C12A_P1a]
Frijoles	2	[C12A_P2]	[C12A_P2a]
Arroz	3	[C12A_P3]	[C12A_P3a]
Azucar	4	[C12A_P4]	[C12A_P4a]
Aceite vegetal	5	[C12A_P5]	[C12A_P5a]
Sal	6	[C12A_P6]	[C12A_P6a]
Plátano verde/maduro, Guineo cuadrado	7	[C12A_P7]	[C12A_P7a]
Papas	8	[C12A_P8]	[C12A_P8a]
Pastas alimenticias, spaguetti, fideos, etc.	9	[C12A_P9]	[C12A_P9a]
Pan Simple; Pan Dulce	10	[C12A_P10]	[C12A_P10a]
Manteca de cerdo	11	[C12A_P11]	[C12A_P11a]
Tomate	12	[C12A_P12]	[C12A_P12a]
Cebolla, Chiltoma	13	[C12A_P13]	[C12A_P13a]
Hueso de res/cerdo	14	[C12A_P14]	[C12A_P14a]
Huevos de gallina	15	[C12A_P15]	[C12A_P15a]
Tortillas	16	[C12A_P16]	[C12A_P16a]
Carne de res	17	[C12A_P17]	[C12A_P17a]
Carne de cerdo/salchichas	18	[C12A_P18]	[C12A_P18a]
Pollo	19	[C12A_P19]	[C12A_P19a]
Pescado	20	[C12A_P20]	[C12A_P20a]
Camarones/Atún/Sardina	21	[C12A_P21]	[C12A_P21a]
Queso, Cuajada, Crema	22	[C12A_P22]	[C12A_P22a]
Manzana, Limón agrio, naranja,agria, naranja dulce, mandarina, y otras frutas	23	[C12A_P23]	[C12A_P23a]
Zanahoria/Remolacha	24	[C12A_P24]	[C12A_P24a]
Mantequilla/Margarina Crema	25	[C12A_P25]	[C12A_P25a]
Leche en polvo/ Leche pasteurizada/vaca	26	[C12A_P26]	[C12A_P26a]
Jugos	27	[C12A_P27]	[C12A_P27a]
Salsa de tomate/	28	[C12A_P28]	[C12A_P28a]
Mayonesa/Mostaza	29	[C12A_P29]	[C12A_P29a]
Miel	30	[C12A_P30]	[C12A_P30a]
Comidas preparados fuera del hogar (ej., restaurante)	31	[C12A_P31]	[C12A_P31a]
Gaseosas	32	[C12A_P32]	[C12A_P32a]
Golosinas	33	[C12A_P33]	[C12A_P33a]
Otros gastos para comida	34	[C12A_P34]	[C12A_P34a]

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